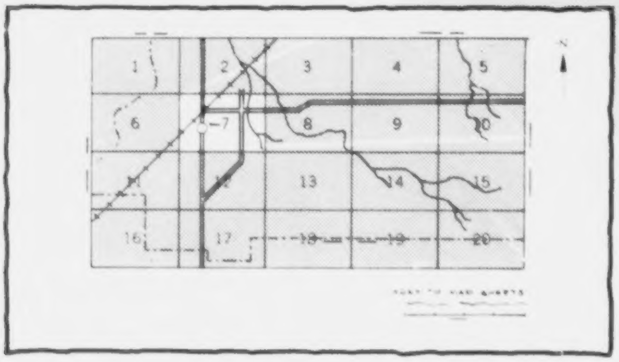
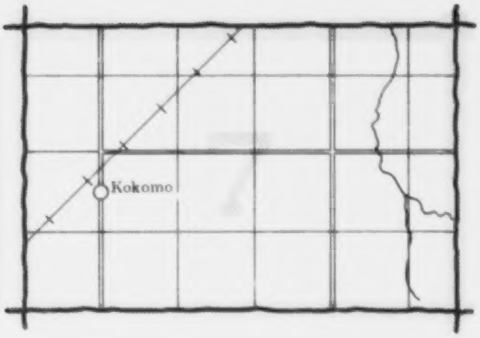
# SOIL SURVEY OF
# SAN SIMON AREA, ARIZONA
## PARTS OF COCHISE, GRAHAM, AND GREENLEE COUNTIES

**United States Department of Agriculture**
**Soil Conservation Service**
**in cooperation with**
**Arizona Agricultural Experiment Station**

# HOW TO USE

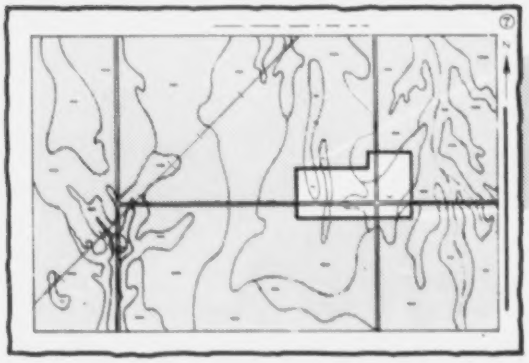
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

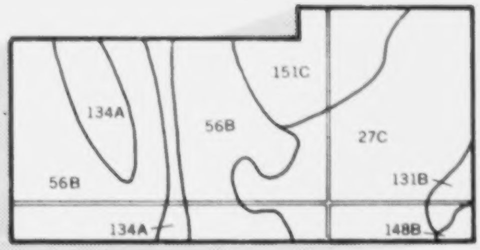

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20



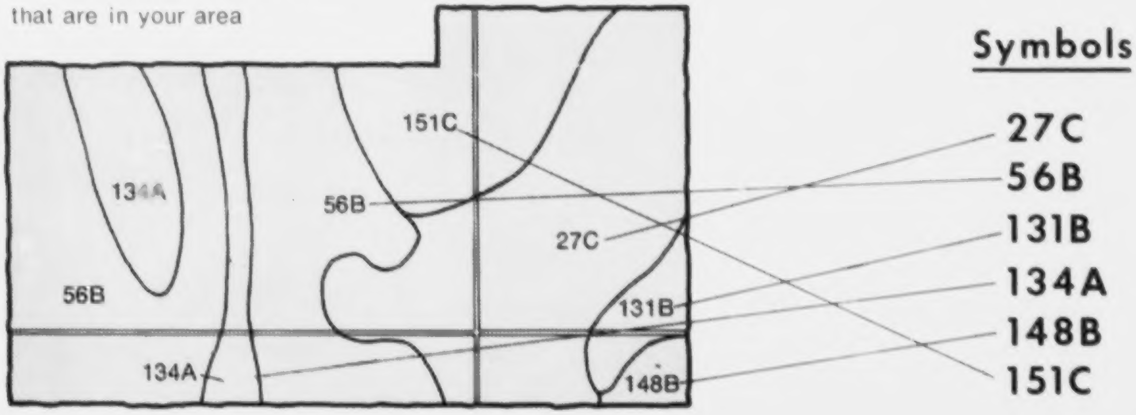
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



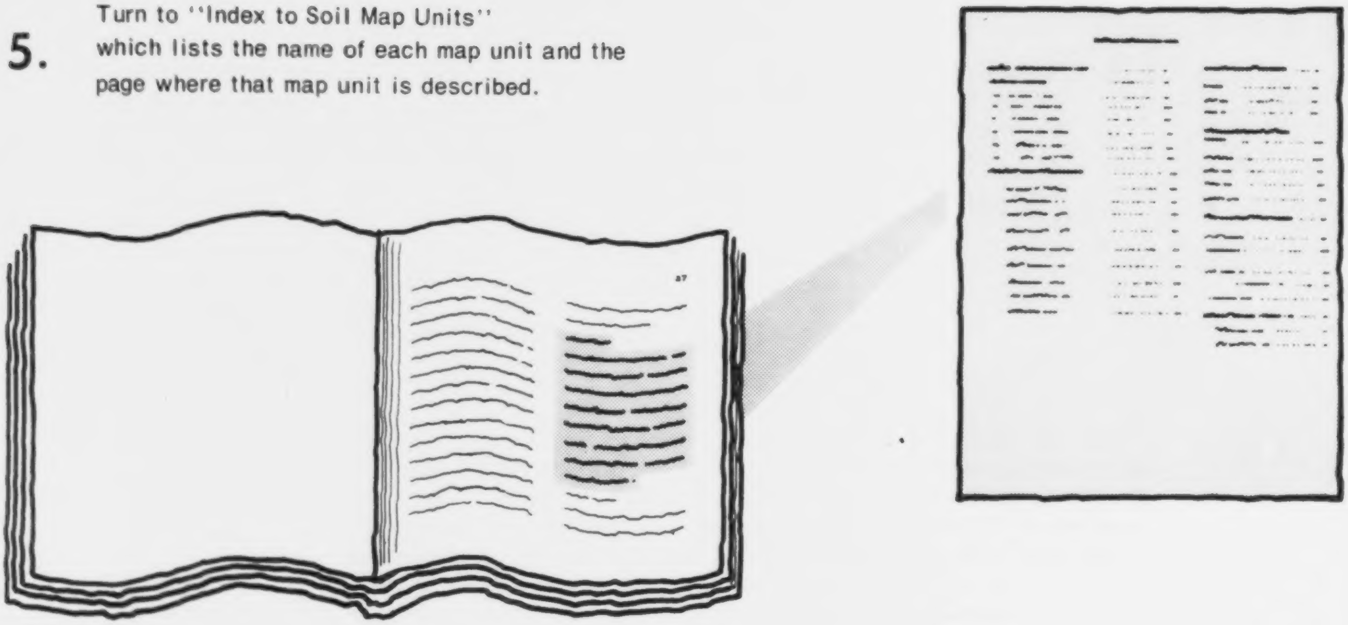

151C
134A
56B
27C
56B
131B
134A
148B

4. List the map unit symbols that are in your area

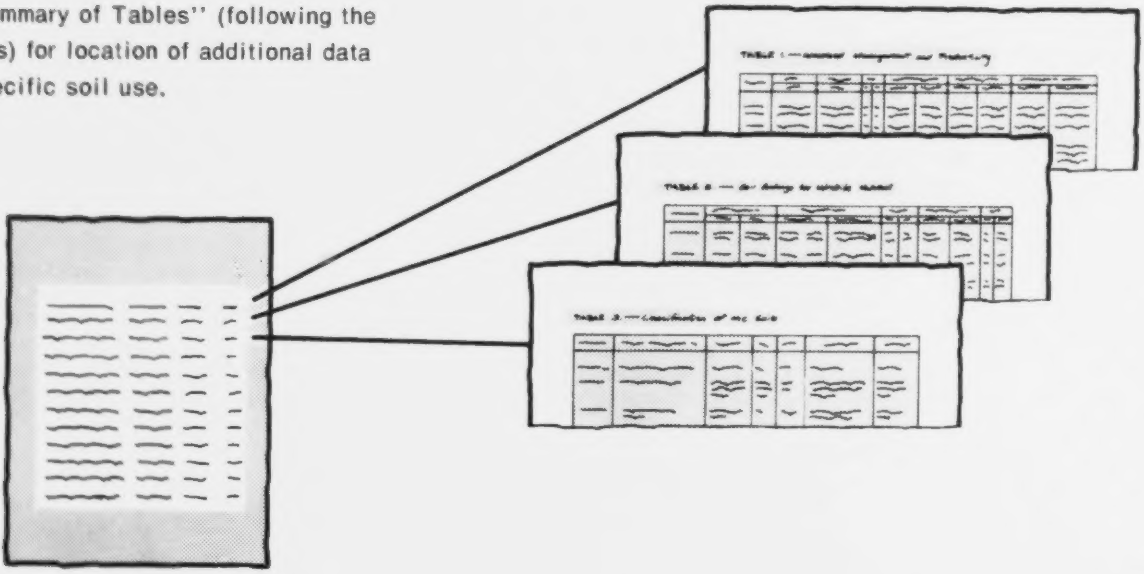

151C
134A
56B
27C
56B
131B
134A
148B
Symbols
27C
56B
131B
134A
148B
151C

# THIS SOIL SURVEY

**5.** Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



**6.** See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



**7.** Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1973-75. Soil names and descriptions were approved in September, 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service, the Arizona Agricultural Experiment Station, and the Bureau of Land Management. It is part of the technical assistance furnished to the Gila Valley Natural Resource Conservation District and the Willcox-San Simon Natural Resource Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

**Cover: Typical scene in survey area, Faraway-Rock outcrop complex is on hills in background and White House-Forrest association is in the nearly level area in foreground.**

# Contents

Page

**Index to soil map units** ... iv
**Summary of tables** ... v
**Foreword** ... vii
**General nature of the survey area** ... 1
  Climate ... 1
  Settlement ... 2
  Ranching and farming ... 2
  Natural resources ... 3
  Elevation, plants, and precipitation ... 3
**How this survey was made** ... 3
**General soil map for broad land use planning** ... 4
  Arid soils of the valley ... 4
    1. Gila-Glendale-Anthony ... 4
    2. Hondale-Bluepoint-Gothard ... 4
    3. Tres Hermanos-Artesia ... 5
    4. Eba-Tres Hermanos-Dona Ana ... 5
  Semiarid soils of the valley ... 5
    5. Pima-Comoro-Santo Tomas ... 5
    6. Tubac-Sonoita-Signal ... 6
    7. White House-Forrest ... 6
  Semiarid soils of the mountains, hills, high fans, and valley plains ... 6
    8. Graham-Atascosa-Bonita ... 6
    9. Atascosa-Chiricahua-Mabray ... 7
  Subhumid soils of the mountains ... 7
    10. Mokiak-Faraway-Rock outcrop ... 7
**Soil maps for detailed planning** ... 7
**Use and management of the soils** ... 30
  Crops and pasture ... 31
  Cropland planning ... 31
    Yields per acre ... 32
    Capability classes and subclasses ... 32
  Rangeland ... 33
  Engineering ... 34
    Building site development ... 35
    Sanitary facilities ... 35
    Construction materials ... 36
    Water management ... 37
  Recreation ... 38
  Wildlife habitat ... 38
**Soil properties** ... 39
  Engineering properties ... 40
  Physical and chemical properties ... 41
  Soil and water features ... 42

Page

**Classification of the soils** ... 43
**Soil series descriptions** ... 44
  Anthony series ... 44
  Arizo series ... 44
  Artesia series ... 45
  Atascosa series ... 45
  Bluepoint series ... 46
  Bonita series ... 46
  Bucklebar series ... 47
  Cave series ... 48
  Chiricahua series ... 48
  Comoro series ... 49
  Continental series ... 49
  Dona Ana series ... 50
  Eba series ... 51
  Faraway series ... 51
  Forrest series ... 52
  Gila series ... 52
  Glendale series ... 53
  Gothard series ... 53
  Grabe series ... 54
  Graham series ... 55
  Guest series ... 55
  Hantz series ... 56
  Hondale series ... 56
  Kimbrough series ... 57
  Mabray series ... 57
  Mokiak series ... 58
  Pima series ... 58
  Pridham series ... 59
  Santo Tomas series ... 59
  Signal series ... 60
  Sonoita series ... 60
  Tres Hermanos series ... 61
  Tubac series ... 62
  Vekol series ... 62
  White House series ... 63
**Formation and morphology of the soils** ... 64
  Formation ... 64
    Parent material ... 64
    Climate ... 64
    Plant and animal life ... 64
    Relief ... 65
    Time ... 65
  Morphology ... 65
**References** ... 66
**Glossary** ... 66
**Illustrations** ... 71
**Tables** ... 83

Issued September 1980

# Index to soil map units

Page
1—Anthony-Gila complex ... 8
2—Arizo soils ... 9
3—Artesia cobbly fine sandy loam ... 9
4—Atascosa-Chiricahua-Rock outcrop complex ... 10
5—Atascosa-Graham-Rock outcrop complex ... 10
6—Bluepoint loamy sand ... 11
7—Bluepoint-Gothard complex ... 11
8—Bonita cobbly silty clay ... 12
9—Bucklebar fine sandy loam ... 12
10—Calciorthids and Torriorthents, eroded ... 13
11—Cave-Durorthids complex ... 13
12—Comoro soils ... 14
13—Continental-Tubac complex ... 14
14—Dona Ana fine sandy loam, 0 to 2 percent slopes ... 15
15—Dona Ana fine sandy loam, 0 to 5 percent slopes ... 15
16—Eba gravelly sandy loam ... 16
17—Eba gravelly fine sandy loam ... 16
18—Faraway-Rock outcrop complex ... 16
19—Forrest-White House-Kimbrough complex ... 17
20—Gila loam ... 18
21—Gila-Anthony-Bluepoint complex ... 18

Page
22—Glendale-Gila complex ... 19
23—Glendale-Gila complex, eroded ... 19
24—Glendale-Gila association, frequently flooded ... 20
25—Graham-Rock outcrop complex ... 20
26—Guest silty clay loam ... 21
27—Guest and Hantz soils ... 21
28—Hondale silty clay loam ... 22
29—Hondale complex ... 22
30—Kimbrough gravelly fine sandy loam ... 23
31—Mabray-Rock outcrop complex ... 23
32—Mokiak-Faraway-Rock outcrop complex ... 24
33—Pima-Grabe silt loams ... 24
34—Pima-Grabe association ... 25
35—Pridham silty clay loam ... 25
36—Santo Tomas soils ... 26
37—Signal gravelly loam ... 26
38—Sonoita gravelly sandy loam ... 27
39—Sonoita fine sandy loam ... 27
40—Tres Hermanos gravelly loam ... 27
41—Tubac sandy clay loam, 0 to 2 percent slopes ... 28
42—Tubac soils, 0 to 5 percent slopes ... 28
43—Tubac-Sonoita complex ... 29
44—Vekol loam ... 29
45—White House-Forrest association ... 30

# Summary of Tables

Page

Acreage and proportionate extent of the soils (Table 7) .......... 88
*Acres. Percent.*

Building site development (Table 10) .......... 102
*Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets.*

Classification of the soils (Table 19) .......... 148
*Soil name. Family or higher taxonomic class.*

Construction materials (Table 12) .......... 112
*Roadfill. Sand. Gravel. Topsoil.*

Engineering properties and classifications (Table 16) .......... 130
*Depth. USDA texture. Classification—Unified, AASHTO. Fragments more than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.*

Freeze dates in spring and fall at Safford (Table 3) .......... 86
*Probability. Temperature.*

Freeze dates in spring and fall at Willcox (Table 4) .......... 86
*Probability. Temperature.*

Growing season length at Safford (Table 5) .......... 87
*Probability. Daily minimum temperature during growing season.*

Growing season length at Willcox (Table 6) .......... 87
*Probability. Daily minimum temperature during growing season.*

Physical and chemical properties of soils (Table 17) .......... 138
*Depth. Clay less than 2 mm. Moist bulk density. Permeability. Available water capacity. Soil reaction. Salinity. Shrink-swell potential. Erosion factors—K, T. Wind erodibility group. Organic matter.*

Rangeland productivity and characteristic plant communities (Table 9) ...... 92
*Range site. Total production—Kind of year, Dry weight. Characteristic vegetation. Composition.*

Recreational development (Table 14) .......... 121
*Camp areas. Picnic areas. Playgrounds. Paths and trails.*

Sanitary facilities (Table 11) .......... 107
*Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.*

## Summary of Tables—Continued

Page

Soil and water features (Table 18) .......... 143

*Hydrologic group. Flooding—Frequency, Duration, Months. High water table—Depth, Kind, Months. Bedrock—Depth, Hardness. Cemented pan—Depth, Hardness. Risk of corrosion—Uncoated steel, concrete.*

Temperature and precipitation at Safford (Table 1) .......... 84

*Month. Temperature—Average daily maximum, Average daily minimum, Average, Average number of growing degree days. Precipitation—Average, Average number of days with 0.10 inch or more, Average snowfall.*

Temperature and precipitation at Willcox (Table 2) .......... 85

*Month. Temperature—Average daily maximum, Average daily minimum, Average, Average number of growing degree days. Precipitation—Average, Average number of days with 0.10 inch or more, Average snowfall.*

Water management (Table 13) .......... 117

*Pond reservoir areas. Embankments, dikes, and levees. Aquifer-fed excavated ponds. Drainage. Irrigation. Terraces and diversions.*

Wildlife habitat potentials (Table 15) .......... 126

*Potential for habitat elements—Grain and seed crops, Grasses and legumes, Wild herbaceous plants, Hardwood trees, Coniferous plants, Shrubs, Wetland plants, Shallow water areas. Potential as habitat for—Openland wildlife, Woodland wildlife, Wetland wildlife, Rangeland wildlife.*

Yields per acre of irrigated crops (Table 8) .......... 89

*Cotton lint. Alfalfa hay. Wheat. Grain sorghum. Barley.*

# Foreword

The Soil Survey of San Simon Area, Parts of Cochise, Graham, and Greenlee Counties, Arizona contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

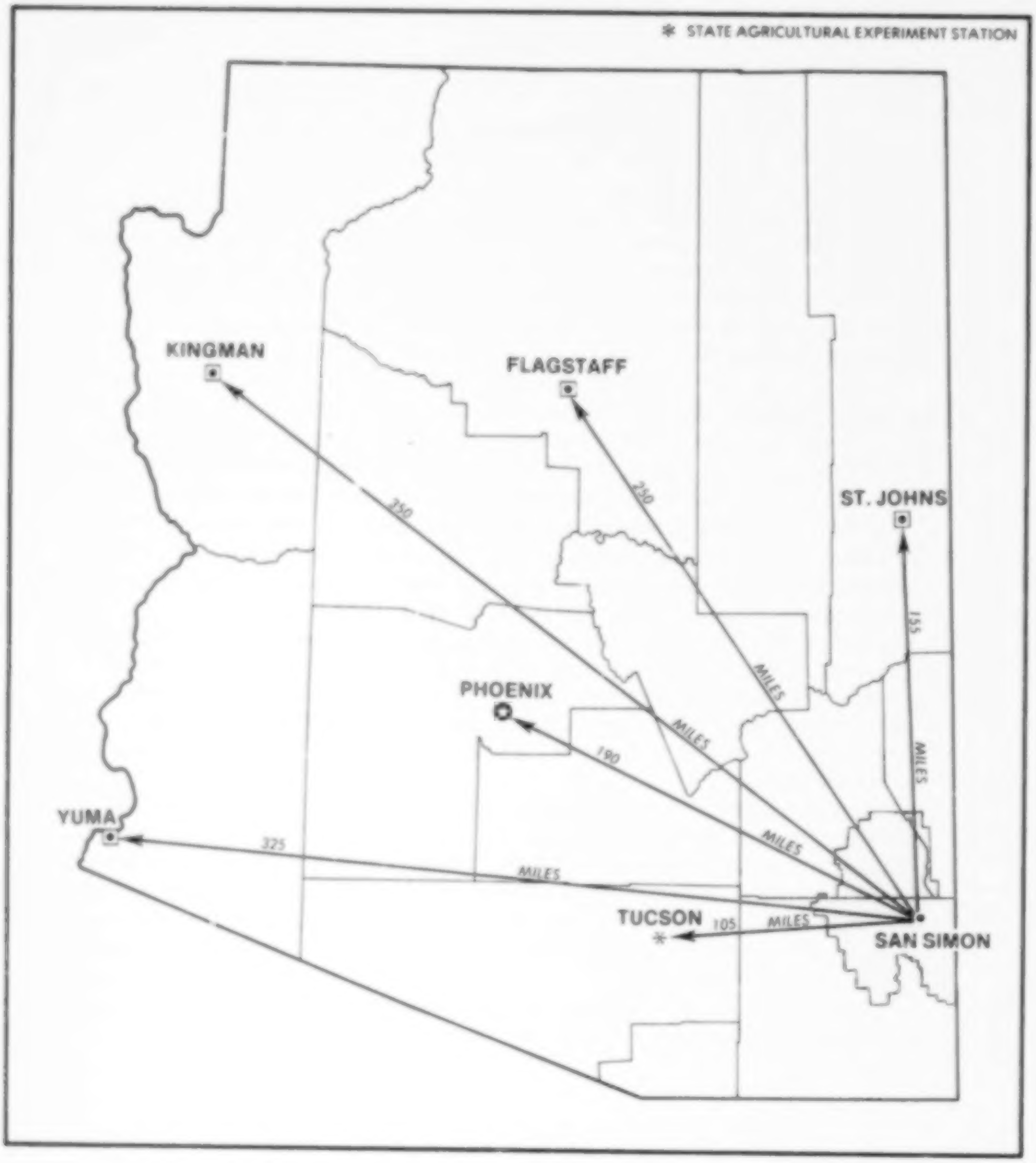
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Thomas G. Rockenbaugh

Thomas G. Rockenbaugh
State Conservationist
Soil Conservation Service


* STATE AGRICULTURAL EXPERIMENT STATION
KINGMAN
FLAGSTAFF
ST. JOHNS
PHOENIX
YUMA
TUCSON
SAN SIMON
350 MILES
230 MILES
155 MILES
190 MILES
325 MILES
105 MILES

*Location of San Simon Area, Parts of Cochise, Graham, and Greenlee Counties in Arizona.*

# SOIL SURVEY OF SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM, AND GREENLEE COUNTIES

**By Kenneth D. Vogt, Soil Conservation Service**

**Soils surveyed by Kenneth D. Vogt, Russel L. Barmore, and Larry H. Humphrey, Soil Conservation Service**

**United States Department of Agriculture, Soil Conservation Service, in cooperation with Arizona Agricultural Experiment Station**

The SAN SIMON AREA is in the southeastern part of Arizona (see map on facing page). It is made up of parts of Cochise, Graham, and Greenlee Counties. The southern-most extension of the Area is the south side of Township 17 south, just south of Portal. The northern-most extension is the north side of Township 7 southeast of Safford. The Area essentially embraces the drainage system of the San Simon River in Arizona.

Most of the survey area is rangeland. However, near the communities of Bowie and San Simon approximately 30,000 acres is in farmland. This land is irrigated. Water for irrigation is pumped from deep wells.

The Southern Pacific Railroad crosses the Area in an east-west direction and passes through the communities of Bowie and San Simon. A branch line of the railroad extends northward from Bowie to Safford, slightly west of the central part of the Area. Interstate-10 passes through Bowie and San Simon and is parallel to the main line of the railroad. Along the west side of the Area, U. S. Highway 666 extends southward from Safford and joins Interstate-10 about 12 miles west of Bowie.

Physiographically, the survey area consists of a broad valley with the San Simon River as its axis (fig. 1). Slopes are gentle near the axis of the valley, but the soils tend to become more sloping near the foothills. The bordering foothills and mountains are steep to very steep.

A variety of rock materials, such as basalt, andesite, rhyolite, granite, tuff, quartzite, and limestone, make up the included and surrounding mountains. These materials strongly influence the soil, thus producing many different kinds of soil.

A large part of the survey area is under the care of the Bureau of Land Management. The next largest part is controlled by the State of Arizona, and a relatively small part is in private ownership.

## General nature of the survey area

In this section the climate, settlement, ranching and farming, and elevation and precipitation of the survey area are briefly described.

### Climate

Summers are hot and winters are cool in the San Simon Area of Arizona. Days in winter are fairly warm, although the temperature drops below freezing in most nights in winter. Rainfall is scant during most months. It is heaviest in summer, when scattered thunderstorms develop in the moist air which occasionally sweeps inland from the Gulf of Mexico. Snow cover in winter is not persistent and is generally confined to higher elevations.

Tables 1 and 2 give data on temperature and precipitation for the survey area, as recorded at Safford and Willcox, for the period 1951 to 1974. Tables 3 and 4 show probable dates of the first freeze in fall and the last freeze in spring. Tables 5 and 6 provide data on length of the growing season.

In winter at Safford the average temperature is 45 degrees F, and the average daily minimum is 29 degrees. The lowest temperature on record at Safford, 7 degrees, occurred on December 24, 1974. In summer the average temperature is 81 degrees, and the average daily maximum is 97 degrees. The highest temperature, 111 degrees, was recorded on June 28, 1973. Slightly south but at a higher elevation in Willcox in winter the average temperature is 43 degrees F, and the average daily minimum is 25 degrees. The lowest temperature on record, -1 degree, occurred at Willcox on January 15, 1962. In summer the average temperature is 76 degrees, and the average daily maximum is 94 degrees. The highest temperature, 109 degrees, was recorded on June 26, 1970.

Growing degree days, shown in tables 1 and 2, are equivalent to "heat units." Beginning in spring, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 6 inches, or 60 percent, generally falls during April through September, which includes the growing season for most crops. In 2 years in 10, rainfall for April through September is less than 4 inches at Safford and less than 6 inches at Willcox. The heaviest 1-day rainfall during the period of record was 2.25 inches at Safford on August 31, 1963. The heaviest 1-day rainfall at Willcox was 2.38 inches on April 26, 1972. Thunderstorms number about 40 each year, 29 of which occur in summer.

Average seasonal snowfall is 2 inches at Safford and 4 inches at Willcox. The greatest snow depth at any one time during the period of record was 6 inches in the survey area. On the average, 1 day has at least 1 inch of snow on the ground during the year.

The average relative humidity in midafternoon in spring is less than 22 percent; during the rest of the year it is about 33 percent. Humidity is higher at night during all seasons, and the average at dawn is about 52 percent. The possibility of sunshine is 84 percent in summer and 81 percent in winter. The prevailing direction of the wind is from the southeast. Average windspeed is highest, 9 miles per hour, in April.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

## Settlement

Coronado, a Spanish explorer, passed near the survey area in 1540. The San Simon Area was Spanish territory until 1821, when Mexico gained its freedom from Spain. In 1854, through the Gadsden Purchase, the United States bought the region below the Gila River from Mexico.

The occupation of the survey area was difficult because of danger from the warlike tribe of Apaches led by Cochise and, later, by Geronimo. Camp Bowie Military Post was established in 1862 at Apache Pass to protect settlers and stage stations along the old Butterfield Overland Stage Route. After the Indian wars, the Post was abandoned in 1894. It is now a National Historic site.

The railroad survey was started in 1854. In 1880 the main line of the Southern Pacific Railroad was built across the survey area and the town of Willcox became a supply station for the surrounding area.

Arizona became a state in 1912. Bowie and San Simon are small unincorporated towns in the survey area, and they service local farmers and ranchers. Both towns have elementary and secondary schools. Larger towns that serve the area are Willcox and Safford, Arizona, and Lordsburg, New Mexico. The economy is based primarily on ranching, farming, and some tourism.

## Ranching and farming

When Colonel Phil Cooke first viewed the San Simon River in 1848, it ran bank-full through a lush valley. A grassland of waist-high grasses stretched to as much as a mile in width.

Following the Indian wars, settlers and miners entered the valley. The demand for meat increased, and vast herds of cattle were driven from Texas. In 1895 an estimated 50,000 head grazed the valley grassland.

Intense grazing was followed by drought shortly after the turn of the century. Heavy rains following the drought washed away the exposed topsoil and started gullies along old wagon roads and trails. By the 1930's the valley had become a classic example of alluvial plain erosion.

The need for corrective action was recognized, and in 1934 the Soil Erosion Service (later the Soil Conservation Service) and the Civilian Conservation Corps (CCC) began erosion work on the San Simon watershed. The responsibility for erosion control work on Public Domain lands was later transferred to the Grazing Service and in 1949 to the Bureau of Land Management.

Rangeland in the San Simon drainage of the survey area is administered under lease arrangements by the Bureau of Land Management and State Land Department. Tracts of patented land are interspersed throughout the survey area; rangeland in the Sulphur Spring Valley is dominantly patented land that is privately owned.

The first settlers in the survey area were mainly cattle ranchers. However, upon the discovery of artesian water in 1910, rapid influx of settlers, mostly from the Southern and Eastern States, homesteaded nearly all the open-land in the valley.

After gaining title to their land, the majority of the homesteaders left the survey area and only those in sections with a more favorable water supply remained to farm. Deep wells and irrigation pumps were developed in the early 1930's to supplement the surface irrigation water supply. New cropland was developed. The ground water, although moderately hard, generally is of good quality for irrigation and domestic uses. In some areas it has high concentration of dissolved salt. Noticeable declines in ground water level are now occurring in the San Simon Basin.

The major areas farmed are in the Bowie and San Simon communities.

The enactment of the Soil Conservation District legislation in 1937 aroused the interest of local landowners. Several conservation districts were formed between 1942 and 1950. Some of those joined together, and presently two Natural Resource Conservation Districts are in the survey area: the Gila Valley in the northern part and the Willcox-San Simon in the southern part.

### Natural resources

Soil is the most important natural resource in the survey area. Livestock that graze the grassland and crops produced on farms are marketable products that are derived from the soil.

### Elevation, plants, and precipitation

Elevation and precipitation vary significantly within the survey area. Elevation ranges from about 3,000 feet where the San Simon River leaves the survey area to 8,363 feet on the top of the Dos Cabezas Mountains. Precipitation ranges from about 7 inches in the valley to 28 inches on top of the mountains. The kinds of vegetation vary as the elevation and precipitation vary. The vegetation grades from desert shrubs and grasses in low precipitation zones and elevations to grasses in intermediate zones and elevations and, hence, to chaparral, oak, and pinyon-juniper at higher precipitation zones and elevations.

The survey area is divided into three precipitation zones (fig. 2). These zones are in the Southeastern Arizona Basin and Range Land Resource Area. They are the 16- to 20-inch, the 12- to 16-inch, and the 7- to 12-inch precipitation zones.

The 7- to 12-inch precipitation zone generally makes up the San Simon Valley and the terraces. Characteristic plants are creosotebush and mesquite. Other common plants include acacia, saltbush, burroweed, snakeweed, pricklypear, alkali sacaton, yucca, black grama, bush muhly, threeawn, tridens, Arizona cottontop, and tobosa. Elevation ranges from 3,000 to approximately 4,500 feet. This zone is characterized by long, gently sloping to strongly sloping old alluvial fans and stream terraces that have deeply incised drainageways and broad, nearly level valley floors.

The 12- to 16-inch precipitation zone makes up the Sulphur Spring Valley and some high fans and low hills in the northern part of the survey area. Dominant plants include sideoats, rothrock, blue, hairy, and sprucetop gramas; cane beardgrass; Arizona cottontop; bristlegrass; Lehmans lovegrass; bush muhly; sacaton; and tobosa. Elevation ranges from approximately 4,000 to 6,000 feet.

The 16- to 20-inch precipitation zone is characterized by gently sloping to hilly old dissected alluvial fans and moderately steep to very steep cobbly and stony hills and mountains. Elevation ranges from 6,000 to 8,363 feet. Vegetation includes oakbrush, juniper, grama grass, and manzanita at lower elevations and pine species at higher elevations with an understory of crinkleawn, plains lovegrass, sideoats grama, and pinyon ricegrass.

## How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

## General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

### Arid soils of the valley

The soils in this group are dominantly deep, well drained, and nearly level to strongly sloping. They are arid and are on flood plains, alluvial fans and terraces, valley plains, and dunes.

#### 1. Gila-Glendale-Anthony

*Very deep, well drained soils on flood plains, alluvial fans, and terraces*

The soils in this map unit formed in alluvium derived from mixed sources. Slope ranges from 0 to 3 percent. Vegetation is mesquite, creosotebush, giant sacaton, cacti, tobosa, annuals, and, in some places, chamiza and trichloris. Elevation ranges from 3,020 to 4,400 feet. Average annual rainfall is 7 to 12 inches, average annual soil temperature is 64 to 70 degrees F, and the frost-free period is 200 to 240 days.

This map unit makes up 5 percent of the survey area. About 40 percent is Gila soils, 30 percent is Glendale soils, and 20 percent is Anthony soils. The rest is Tres Hermanos, Bluepoint, Gothard, Hondale, and Hantz soils and Torriorthents and Calciorthids.

Typically, Gila soils have a pale brown loam surface layer. The underlying material is pale brown loam that has thin layers of fine sandy loam to silt loam to a depth of 60 inches or more.

Typically, Glendale soils have a pale brown silty clay loam surface layer. The underlying material is stratified pale brown or very pale brown silty clay loam and silt loam to a depth of 60 inches or more.

Typically, Anthony soils have a pale brown sandy loam surface layer. The underlying layers are light yellowish brown sandy loam, gravelly sandy loam, fine sandy loam, and loam to a depth of 60 inches or more.

The soils in this map unit are used mainly for rangeland. Glendale and Gila soils are subject to piping and yield significant amounts of sediment. Where slopes are not stabilized, moderate to severe erosion has resulted in surface movement of the soil and the formation of arroyos and gullies. Some areas are saline and strongly alkaline.

#### 2. Hondale-Bluepoint-Gothard

*Very deep, somewhat excessively drained to moderately well drained, saline and sodic soils on dunes, alluvial fans, and terraces*

The soils in this map unit formed in old alluvium derived from mixed sources and in old lake deposits. Slope ranges from 0 to 15 percent. Relief is nearly level to rolling as a result of wind action that deposited sand around shrubs and formed dunes. Vegetation is burrograss, alkali sacaton, saltbush, mesquite, yucca, and annuals. Elevation ranges from 3,200 to 4,000 feet. Average annual rainfall is 7 to 12 inches, average annual soil temperature is 66 to 70 degrees F, and the frost-free period is 190 to 240 days.

This map unit makes up about 11 percent of the survey area. About 30 percent is Hondale soils, 20 percent is Bluepoint soils, and 15 percent is Gothard soils. The rest is Vekol, Dona Ana, Guest, Anthony, Pima, Grabe, Hantz, Glendale, and Gila soils.

Typically, Hondale soils have a pale brown silty clay loam and brown silt loam surface layer. The subsoil is light brown silty clay and silty clay loam. The underlying material is pinkish gray silty clay loam to a depth of 60 inches or more.

Typically, Bluepoint soils have a pale brown loamy sand surface layer. The underlying material is stratified pale brown and brown loamy sand and loamy fine sand to a depth of 60 inches or more.

Typically, Gothard soils have a very pale brown fine sandy loam surface layer. The subsoil is light brown and very pale brown sandy clay loam. The underlying material is stratified light brownish gray sandy loam, very fine sandy loam, and loamy sand to a depth of 60 inches or more.

The soils in this map unit are used for rangeland and irrigated crops. These soils are commonly strongly alkaline, but in places they are saline. Where saline, they are used for rangeland. Where irrigated, the Hondale soils respond to treatment, and alkali-tolerant crops can be economically grown.

### 3. Tres Hermanos-Artesia

*Very deep to moderately deep, well drained soils on alluvial fans and terraces*

The soils in this map unit formed in old gravelly alluvium derived from basic igneous rock, volcanic ash, and tuff. Slope ranges from 0 to 30 percent. Vegetation is creosotebush, bush muhly, catclaw, Mormon-tea, cacti, and annuals. Elevation ranges from 3,200 to 5,200 feet. Average annual rainfall is 8 to 12 inches, average annual soil temperature is 60 to 68 degrees F, and the frost-free period is 180 to 240 days.

This map unit makes up 14 percent of the survey area. About 45 percent is Tres Hermanos soils and 20 percent is Artesia soils. The rest is Cave, Bonita, Arizo, Eba, and Dona Ana soils and Durothids, Calciorthids, and Torriorthents.

Typically, Tres Hermanos soils have a pink gravelly loam surface layer. The subsoil is reddish brown gravelly clay loam and gravelly loam. The substratum is pink and light reddish brown gravelly loam and pink gravelly fine sandy loam to a depth of 60 inches or more.

Typically, Artesia soils have a light brown cobbly fine sandy loam surface layer. The subsoil is brown very gravelly sandy clay loam and reddish brown very gravelly clay loam and gravelly clay. A pink, silica- and lime-cemented pan is at a depth of 20 to 40 inches.

The soils in this map unit are droughty and are used mainly for rangeland.

### 4. Eba-Tres Hermanos-Dona Ana

*Very deep, well drained soils on alluvial fans and terraces*

The soils in this map unit formed in old alluvium derived from mixed rocks. Slope ranges from 0 to 15 percent. Vegetation is creosotebush, mesquite, catclaw, bush muhly, dropseed, tarbush, cacti, and annuals. Elevation ranges from 3,700 to 5,000 feet. Average annual rainfall is 8 to 14 inches, average annual soil temperature is 60 to 66 degrees F, and the frost-free period is 180 to 220 days.

This map unit makes up 11 percent of the survey area. About 35 percent is Eba soils, 20 percent is Tres Hermanos soils, and about 20 percent is Dona Ana soils. The rest is Tubac, White House, Forrest, Continental, Santo Tomas, Comoro, Arizo, Anthony, and Gila soils.

Typically, Eba soils have a brown gravelly fine sandy loam surface layer. The subsoil is reddish brown very gravelly sandy clay loam and yellowish red very gravelly clay and gravelly clay. The substratum is pinkish white and reddish yellow very gravelly loam to a depth of 60 inches or more.

Typically, Tres Hermanos soils have a pink gravelly loam surface layer. The subsoil is reddish brown gravelly clay loam and gravelly loam. The substratum is pink and light reddish brown gravelly loam and pink gravelly fine sandy loam to a depth of 60 inches or more.

Typically, Dona Ana soils have a light brown fine sandy loam surface layer. The subsoil is brown loam. The substratum is pinkish white and light brown or pinkish gray and light brown loam to a depth of 60 inches or more.

The soils in this map unit are used mainly for rangeland. Dona Ana and Eba soils are irrigated and farmed in some areas south of San Simon.

## Semiarid soils of the valley

The soils in this group are dominantly deep, well drained, and nearly level to moderately steep. These soils are on flood plains, alluvial fans, valley side slopes, and hills. They are semiarid.

### 5. Pima-Comoro-Santo Tomas

*Very deep, well drained soils on flood plains, alluvial fans, and terraces*

The soils in this map unit formed in alluvium derived from mixed sources. Slope ranges from 0 to 9 percent. Vegetation is mesquite, tobosa, catclaw, lovegrasses, cacti, yucca, burroweed, and annuals. Juniper and oak are on higher elevations of the Santo Tomas soils. Elevation ranges from 3,500 to 5,400 feet. Average annual rainfall is 9 to 14 inches, average annual soil temperature is 59 to 68 degrees F, and the frost-free period is 170 to 240 days.

This map unit makes up 9 percent of the survey area. About 35 percent is Pima soils, 30 percent is Comoro soils, and 20 percent is Santo Tomas soils. The rest is Grabe, Arizo, Eba, White House, Forrest, Tubac, Sonoita, Bucklebar, Dona Ana, and Anthony soils.

Typically, Pima soils have a brown silt loam surface layer. The underlying material is stratified brown silty clay loam and silt loam to a depth of 60 inches or more.

Typically, Comoro soils have a brown fine sandy loam surface layer. The underlying material is stratified brown and pale brown fine sandy loam and grayish brown gravelly fine sandy loam to a depth of 60 inches or more.

Typically, Santo Tomas soils have a surface layer that is grayish brown cobbly fine sandy loam in the upper part and dark brown gravelly loam and dark grayish brown very gravelly fine sandy loam in the lower part. The underlying material is grayish brown very fine sandy loam to a depth of 60 inches or more.

The soils in this map unit are commonly used for livestock grazing and wildlife habitat. Pima soils are irrigated and farmed in some areas. Santo Tomas soils are a source of gravel.

### 6. Tubac-Sonoita-Signal

*Very deep, well drained soils on valley side slopes, alluvial fans, and terraces*

The soils in this map unit formed in old alluvium derived mainly from acid igneous rock. Slope ranges from 0 to 15 percent. Vegetation is mesquite, catclaw, perennial broomweed, Mormon-tea, tobosa, grama grasses, cacti, and annuals. Elevation ranges from 3,200 to 5,000 feet. Average annual rainfall is 8 to 16 inches, average annual soil temperature is 60 to 68 degrees F, and the frost-free season is 180 to 220 days.

This map unit makes up 22 percent of the survey area. About 25 percent is Tubac soils, 25 percent is Sonoita soils, and 10 percent is Signal soils. The rest is Continental, Bucklebar, White House, Forrest, Comoro, Grabe, and Pima soils.

Typically, Tubac soils have a light reddish brown gravelly sandy loam surface layer. The subsurface layer is light brown gravelly loam. The subsoil is reddish brown clay in the upper part and is reddish yellow clay loam in the lower part to a depth of 60 inches or more.

Typically, Sonoita soils have a light reddish brown gravelly sandy loam surface layer. The subsoil is reddish brown and brown gravelly sandy loam. The substratum is light reddish brown fine sandy loam and reddish brown and yellowish red gravelly sandy clay loam to a depth of 50 inches or more.

Typically, Signal soils have a dark grayish brown gravelly loam surface layer. The subsoil is dark brown very gravelly clay loam, reddish brown very gravelly clay, and reddish brown very gravelly sandy clay loam. The substratum is brown and pink very gravelly sandy loam and strong brown very gravelly loamy sand to a depth of 60 inches or more.

All soils in this map unit, except Signal soils, are used for livestock grazing and for the commonly grown irrigated crops. Signal soils are on hills and are used for livestock grazing and wildlife habitat. The soils in this unit are rated among those soils in the survey area that have the highest potential for production of forage.

### 7. White House-Forrest

*Very deep, well drained soils on valley plains and alluvial fans*

The soils in this map unit formed in old alluvium derived from mixed rocks and sedimentary rock. Slope ranges from 0 to 20 percent. Vegetation is grama grasses, perennial broomweed, cane beardgrass, feather fingergrass, and burroweed. Elevation ranges from 4,700 to 5,300 feet. Average annual rainfall is 12 to 16 inches, average annual soil temperature is 59 to 66 degrees F, and the frost-free period is 180 to 220 days.

This map unit makes up 4 percent of the survey area. About 40 percent is White House soils and 35 percent is Forrest soils. The rest is Kimbrough, Santo Tomas, Comoro, Grabe, Pima, and Guest soils.

Typically, White House soils have a brown gravelly loam surface layer. The subsoil is reddish brown and yellowish red clay in the upper part and is yellowish red gravelly clay in the lower part to a depth of 60 inches or more.

Typically, Forrest soils have a brown sandy loam surface layer. The subsoil is reddish brown, yellowish red, and brown clay and gravelly clay. The substratum has lime accumulation and is brown or light brown clay loam to a depth of 54 inches or more.

The soils in this map unit are mainly used for rangeland. In the survey area they are rated among the soils that have the highest forage production.

## Semiarid soils of the mountains, hills, high fans, and valley plains

The soils in this group are dominantly very shallow to deep, well drained, and gently sloping to very steep. These soils are on mountains, hills, high alluvial fans, and valley plains. They are semiarid.

### 8. Graham-Atascosa-Bonita

*Shallow to deep, well drained soils on mountains, hills, alluvial fans, and valley plains*

The soils in this map unit formed in residuum and alluvium derived from basalt and andesite rock. Slope ranges from 2 to 45 percent. Vegetation is tobosa, catclaw, cacti, and grama grasses and at higher elevations, juniper. Elevation ranges from 3,500 to 5,500 feet. Average annual precipitation is 10 to 16 inches, average annual soil temperature is 59 to 68 degrees F, and the frost-free period is 180 to 240 days.

This map unit makes up 14 percent of the survey area. About 30 percent is Graham soils, 25 percent Atascosa soils, and 10 percent Bonita soils. The rest is Chiricahua and Cave soils, Rock outcrop, and talus slopes.

Typically, Graham soils have a brown cobbly clay loam surface layer. The subsoil is reddish brown gravelly clay. Fractured basalt is at a depth of 17 inches.

Typically, Atascosa soils have a brown cobbly loam surface layer. The subsoil is dark grayish brown very gravelly clay loam. Rhyolite or andesite bedrock is at a depth of 12 inches.

Typically, Bonita soils have a surface layer that is brown cobbly silty clay in the upper part and dark brown clay loam in the lower part. The underlying material is reddish brown and brown clay in the upper part and is brown very gravelly clay in the lower part to a depth of 55 inches or more.

The soils in this map unit are used for livestock grazing, wildlife habitat, and recreation.

### 9. Atascosa-Chiricahua-Mabray

*Shallow, well drained soils on mountains and hills*

The soils in this map unit formed in residuum of acid igneous rock and limestone. Slope ranges from 9 to 70 percent. Vegetation is grama grasses, catclaw, mesquite, cacti, beargrass, tobosa, ocotilla, and annuals. Elevation ranges from 4,000 to 5,800 feet. Average annual precipitation is 10 to 16 inches, average annual soil temperature is 59 to 66 degrees F, and the frost-free period is 180 to 240 days.

This map unit makes up 6 percent of the survey area. About 45 percent is Atascosa soils, 15 percent is Chiricahua soils, and 10 percent is Mabray soils. The rest is Rock outcrop and Faraway, Mokiak, White House, Forrest, Kimbrough, and Santo Tomas soils.

Typically, Atascosa soils have a brown stony sandy loam surface layer. The subsoil is dark grayish brown very gravelly sandy clay loam. The substratum is white fractured granite. Hard bedrock is at a depth of less than 10 inches.

Typically, Chiricahua soils have a brown gravelly sandy loam surface layer. The subsoil is reddish brown gravelly clay loam and reddish brown gravelly clay. The substratum is reddish yellow and white weathered granite and reddish brown gravelly clay. Granite bedrock is at a depth of 27 inches.

Typically, Mabray soils have a brown very gravelly loam surface layer. The underlying material is black fractured limestone. Hard limestone is at a depth of 15 inches.

The soils in this map unit are used for livestock grazing, wildlife habitat, recreation, and in some places, mining.

## Subhumid soils of the mountains

The soils in this group are subhumid. They are dominantly very shallow to moderately deep, well drained, and moderately steep to very steep. These soils formed on mountains.

### 10. Mokiak-Faraway-Rock outcrop

*Shallow to moderately deep, well drained soils and Rock outcrop on mountains and hills*

The soils in this map unit formed in residuum of mixed rocks, dominantly granite, andesite, and rhyolite. Slope ranges from about 15 to 75 percent. Vegetation is mountainmahogany, oakbrush, juniper, beargrass, grama grasses, and cacti. Elevation ranges from 5,200 to more than 8,000 feet. Average annual precipitaiton is 16 to 20 inches, average annual soil temperature is 47 to 59 degrees F, and the frost-free period is 150 to 180 days.

This map unit makes up 4 percent of the survey area. About 30 percent is Faraway soils, 30 percent is Mokiak soils, and 20 percent is Rock outcrop. The rest is soils that are similar to these soils but are over fractured limestone and colluvial soils that are deeper than 20 inches at the base of slopes and along drainages.

Typically, Mokiak soils have a dark grayish brown cobbly sandy clay loam surface layer. The subsoil is brown and light gray very gravelly sandy clay loam. The substratum is yellowish brown weathered granite. Hard granite is at a depth of 30 inches.

Typically, Faraway soils have a grayish brown very cobbly loam surface layer. The underlying material is light gray fractured rhyolite. Hard rhyolite is at a depth of 18 inches.

Rock outcrop is more than 90 percent exposed bedrock, mainly rhyolite, andesite, and granite. It provides concealment for wildlife and is used mainly for wildlife and recreation.

The soils in this map unit are used for livestock grazing, wildlife habitat, and recreation and in some places, mining.

# Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. This means that soil boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Soil boundaries were plotted and verified at wider intervals. The narrowly defined units are indicated by an asterisk in the soil map legend. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use.

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Eba gravelly sandy loam is one of several phases within the Eba series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Anthony-Gila complex is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. White House-Forrest association is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Guest and Hantz soils is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Rock outcrop is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 7, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

**1—Anthony-Gila complex.** These nearly level to gently sloping soils are on alluvial fans and flood plains. Elevation ranges from 3,100 to 4,000 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope dominantly is 0 to 3 percent, but in places it ranges to 5 percent.

Anthony sandy loam makes up about 45 percent of the map unit, and Gila loam makes up 30 percent. These soils are intermingled with Anthony soils on the interfluves and Gila soils in the drainageways.

Included with these soils in mapping are small areas of Glendale soils, small areas of Calciorthids and Torriorthents, eroded, and localized areas of soils that are saline or alkali.

The Anthony sandy loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown sandy loam about 4 inches thick. The underlying material is stratified light yellowish brown sandy loam, gravelly sandy loam, fine sandy loam, and loam to a depth of 60 inches or more.

The Anthony soil has moderately rapid permeability, and available water capacity is moderate. Observed rooting depth is 35 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 9 to 11 inches. Surface runoff is slow. The hazards of soil blowing and water erosion are moderate. This soil is subject to frequent flooding.

The Gila loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of fine sandy loam to a depth of 60 inches or more.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth is 14 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 10 inches. Surface runoff is medium, and the hazard of soil blowing is moderate. This soil is subject to piping and gully erosion. Where grades are not stabilized, the hazards of headcutting and sediment production are high. This soil is also subject to frequent flooding.

The soils in this complex are used mainly for livestock grazing. Present vegetation on the Anthony soil is mesquite, creosotebush, fourwing saltbush, bush muhly, and cacti. Proper management of the vegetation is designed to increase production of bush muhly, plains bristlegrass, black grama, and in some places, fourwing saltbush and alkali sacaton. Present vegetation on the Gila soil is creosotebush, bush muhly, and fourwing saltbush. Proper management of the vegetation is designed to increase production of sacaton, cane beardgrass, alkali sacaton, and fourwing saltbush.

Grazing management that maintains the plant cover is important. Developing sources of water and building fences are important in planning grazing systems. Management of the brush on both soils and pitting on the Gila soil helps improve deteriorated range. Seeding of adapted species of plants is needed. Erosion control structures are necessary in some areas.

Controlling grazing, developing sources of water, and leaving some brush for use as cover help in managing wildlife habitat.

This complex is in capability subclass VIw.

**2—Arizo soils.** This undifferentiated group is made up of nearly level to gently sloping soils on flood plains. Elevation ranges from 3,200 to 5,200 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope ranges from 0 to 5 percent.

Arizo fine sandy loam, Arizo gravelly sandy loam, and Arizo gravelly loamy sand are nearly equal in extent and make up 90 percent of the map unit. Included with these soils in mapping are small areas of Anthony, Gila, and Tres Hermanos soils and soils that are similar to Arizo soils but have finer texture over gravelly loamy sand at a depth of 20 to 30 inches.

The Arizo soils are very deep and excessively drained. They formed in recent gravelly alluvium from mixed sources. Typically, the surface layer is brown fine sandy loam, gravelly sandy loam, or gravelly loamy sand about 3 inches thick. The underlying material is brown very gravelly loamy sand to a depth of 60 inches or more and has thin strata of gravelly sandy loam or very gravelly sand.

Permeability is very rapid, and available water capacity is low. Observed rooting depth is 26 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is about 12 to 14 inches. It consists of rainfall and of the runoff from adjacent areas. Surface runoff is slow except following a high intensity thundershower. The hazard of soil blowing is slight. Water erosion is slight except during periods of flash floods. These soils are subject to occasional flooding. They receive runoff from adjacent areas.

The soils in this unit are used for livestock grazing, wildlife habitat, and as a source of construction material. Vegetation is varied. It includes sideoats grama, Arizona cottontop, bush muhly, catclaw, cane beardgrass, wolfberry, Apacheplume, and desert willow. Proper management of the vegetation is designed to increase the production of sideoats grama, Arizona cottontop, bush muhly, and cane beardgrass.

Grazing management that maintains the plant cover is desirable. Grazing systems that defer grazing 1 year out of 2 or 3 help to maintain desirable plants. Management of the brush helps to improve areas that have deteriorated. Seeding of adapted species of plants is needed.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in management of wildlife habitat.

In the survey area, the Arizo soils are the best source of sand and gravel.

This undifferentiated group is in capability subclass VIw.

**3—Artesia cobbly fine sandy loam.** This moderately deep and well drained soil is on high alluvial fans and terraces. Elevation ranges from 3,200 to 5,200 feet (fig. 3). This soil formed in old alluvium from mixed material, dominantly ash and tuff. Average annual precipitation is about 11 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 220 days. Slope dominantly is 0 to 5 percent but, in places, ranges to 8 percent.

Included with this soil in mapping and making up about 10 percent of mapped areas is Artesia gravelly loam; making up about 30 percent is Eba, Tres Hermanos, and Cave soils and soils that are similar to this Artesia soil but have less coarse fragments in the subsoil.

Typically, the surface layer is light brown cobbly fine sandy loam about 3 inches thick. The subsoil is brown very gravelly sandy clay loam and reddish brown very gravelly clay loam and very gravelly clay to a depth of 25 inches. The substratum is a pink, silica-lime, strongly cemented pan.

Permeability is moderately slow above the pan, and available water capacity is low. Observed rooting depth is 25 inches, and potential rooting depth is to the pan. The water supplying capacity is 7 to 9 inches. Surface runoff is medium. The hazard of soil blowing is slight. The hazard of water erosion is slight to moderate depending on slopes.

This Artesia soil is used mainly for livestock grazing. The present vegetation is catclaw, Mormon-tea, perennial broomweed, tobosa, and some cacti. Proper management of the vegetation is designed to increase the production of black grama, bush muhly, blue grama, and plains bristlegrass.

Grazing management that maintains the plant cover is desirable on this soil. For grazing, livestock prefer areas of this soil. Grazing systems that include developing water sources and building fences are beneficial. Management of the brush helps improve deteriorated range.

Controlling grazing and leaving some brush for use as cover in associated drainageways help in managing wildlife habitat.

This soil is in capability subclass VIe.

**4—Atascosa-Chiricahua-Rock outcrop complex.** These strongly sloping to steep soils and Rock outcrop are on hills and mountains. Elevation ranges from 4,000 to 5,400 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 61 degrees F, and average frost-free period is about 200 days. Slope dominantly is 15 to 50 percent but, in places, ranges from 8 to 50 percent.

Atascosa stony sandy loam makes up about 50 percent of this map unit, Chiricahua gravelly sandy loam makes up 20 percent, and Rock outcrop makes up 10 percent. These soils and Rock outcrop are intermingled with moderately steep to steep Atascosa soils between the outcrops and with strongly sloping to moderately steep Chiricahua soils on ridges and lower side slopes.

Included with these soils in mapping are small areas of White House, Santo Tomas, and Mabray soils.

The Atascosa soil is shallow and well drained. It formed in residuum from granite. Typically, the surface layer is brown stony sandy loam about 2 inches thick. The subsoil is dark grayish brown very gravelly sandy clay loam to a depth of about 7 inches. The substratum is white, fractured granite and has clay films along the fractures. Hard, white granite is at a depth of 10 inches.

The Atascosa soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 7 inches, and the potential rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Intermingled Rock outcrop and stone contribute runoff to this soil. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

The Chiricahua gravelly sandy loam is shallow and well drained. It formed in residuum from granite and related rock. Typically, the surface layer is brown gravelly sandy loam about 2 inches thick. The subsoil is reddish brown gravelly clay loam and reddish brown gravelly clay to a depth of about 18 inches. The substratum is reddish yellow and white weathered granite and reddish brown gravelly clay to a depth of about 27 inches. White granite is at a depth of 27 inches.

The Chiricahua soil has slow permeability, and available water capacity is low. Observed rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Surface runoff is moderate. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly granite. It provides concealment for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex are used mainly for livestock grazing, wildlife habitat, and recreation. The present vegetation on the Atascosa soil is sideoats grama, blue grama, catclaw, and cacti and, at a higher elevation, some oak and juniper. The present vegetation on the Chiricahua soil is mesquite, catclaw, perennial broomweed, sideoats grama, black grama, and tobosa. Proper management of the vegetation on both soils is designed to increase the production of sideoats grama, black grama, blue grama, and cane beardgrass.

Grazing management that maintains the plant cover is important. Livestock utilize the accessible parts of the area, and small rills can develop along trails. Grazing systems that include developing water sources and building fences are beneficial.

Controlling grazing and developing water sources help in managing wildlife. The uneven surface together with large boulders that give the area a rugged appearance and the wide variety of plants provide aesthetic appeal. Popular recreation activities include hiking, wildlife observation, and hunting.

These soils are in capability subclass VIIs.

**5—Atascosa-Graham-Rock outcrop complex.** These strongly sloping to very steep soils and Rock outcrop are on hills and mountains. Elevation ranges from 3,400 to 5,600 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 61 degrees F, and average frost-free period is about 200 days. Slope dominantly is 15 to 50 percent but, in places, ranges from 9 to 70 percent.

Atascosa cobbly loam makes up about 45 percent of the map unit, Graham cobbly clay loam makes up 20 percent, and Rock outcrop makes up 20 percent. These soils and the Rock outcrop are intermingled with the moderately steep to very steep Atascosa soils that are between outcrops of rhyolite and andesite bedrock and with the strongly sloping to steep Graham soils that are on side slopes between outrops of basalt bedrock.

Included with these soils in mapping are small areas of Arizo, Cave, and Tres Hermanos soils.

The Atascosa cobbly loam is shallow and well drained. It formed in residuum from rhyolite and some andesite. Typically, the surface layer is brown cobbly loam about 2 inches thick. The subsoil is dark grayish brown very gravelly clay loam to a depth of about 10 inches. The substratum is pinkish gray fractured rhyolite about 2 inches thick over hard rhyolite.

The Atascosa soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 10 inches, and potential rooting depth is to bedrock. The water supplying capacity is 7 to 9 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate to high.

The Graham cobbly clay loam is shallow and well drained. It formed in residuum from basalt and some andesite. Typically, the surface layer is brown cobbly clay loam about 2 inches thick. The subsoil is reddish brown gravelly clay to a depth of 13 inches. The substratum is fractured basalt that has a lime accumulation about 4 inches thick. Hard basalt is at a depth of 17 inches.

The Graham soil has slow permeability, and available water capacity is low. Observed rooting depth is 13 inches, and potential rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Surface runoff is slow. The hazards of soil blowing and water erosion are slight.

Rock outcrop is more than 90 percent bedrock, mainly basalt, rhyolite, and andesite. It provides concealment for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex are used for livestock grazing, wildlife habitat, and recreation. The present vegetation on the Atascosa soil is sideoats, black, and hairy gramas, prickly pear, cactus, perennial broomweed, and juniper. Proper management of the vegetation is designed to increase the production of sideoats and black gramas, cane beardgrass, and plains lovegrass. The present vegetation on the Graham soil is tobosa, catclaw, cacti, and perennial broomweed. Proper management of the vegetation is designed to increase the production of black and sideoats gramas, cane beardgrass, and Arizona cottontop.

Grazing management that maintains the plant cover is desirable. Building fences, developing water sources, and clearing trails are necessary to assist in distribution of grazing. Livestock avoid areas of Atascosa and Graham soils for grazing if more level, less rocky soils are available. Areas of these soils in which range is deteriorated respond well to properly managed rotation grazing systems.

Controlling grazing and developing water sources help in managing wildlife.

The mountains in areas of this complex have outcrops of rock with various shades of color and have a wide variety of plants. Popular recreation activities are hiking, rock hunting, wildlife observation, and hunting.

This complex is in capability subclass VIIs.

**6—Bluepoint loamy sand.** This very deep and somewhat excessively drained soil is on dunes and high alluvial fans. Elevation ranges from 3,200 to 4,500 feet. This soil formed in alluvium and windblown material from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 230 days. Slope dominantly is about 0 to 8 percent, but short slopes range to 15 percent on dunes.

Bluepoint loamy sand makes up 60 percent of this map unit, and Bluepoint loamy fine sand makes up 10 percent. Included with this soil in mapping are small areas of Gothard and Anthony soils; Calciorthids and Torriorthents, eroded; and soils that are similar to this Bluepoint soil but are noncalcareous to a depth of 40 inches or more.

Typically, the surface layer is pale brown loamy sand about 2 inches thick. The underlying material is stratified pale brown loamy sand and brown and very pale brown loamy fine sand to a depth of 60 inches or more.

Permeability is rapid, and available water capacity is moderately low. Observed rooting depth is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 5 to 8 inches. Surface runoff is slow. The hazard of soil blowing is high and that of water erosion is slight.

This soil is mainly used for livestock grazing. The present vegetation is mesquite, fourwing saltbush, and annuals. Proper management of the vegetation is designed to increase the production of fourwing saltbush, spike and mesa dropseed, and bush muhly.

Grazing management that maintains the plant cover is very important. Soil blowing is a hazard. The surface of this unit has dunes or is hummocky because of windblown material 'deposited around the base of shrubs. Building fences and developing water sources are necessary to help in distribution of grazing. Plants green up very early in spring even if rainfall is only scant. To allow plant growth, grazing should be restricted early in spring. Management of the brush is required on deteriorated range. Plants in areas of this unit are fragile and quickly deteriorate, unless the management is geared to plant needs.

Controlling grazing and developing water sources help in managing wildlife.

This soil is in capability subclass VIe.

**7—Bluepoint-Gothard complex.** These nearly level to strongly sloping soils are on dunes and alluvial terraces. Elevation ranges from 3,200 to 4,500 feet (fig. 4). Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 230 days. Slope dominantly is 0 to 8 percent, but short slopes range to 15 percent.

Bluepoint loamy sand makes up about 45 percent of this map unit, and Gothard fine sandy loam makes up 40 percent. These soils are intermingled with the Bluepoint soils on dunes, the Gothard soils on terraces, and the blown out areas between dunes. Included with these soil in mapping are small areas of Anthony, Gila, and Glendale soils.

The Bluepoint loamy sand is very deep and somewhat excessively drained. It formed in alluvium and windblown material from mixed sources. Typically, the surface layer is pale brown loamy sand about 2 inches thick. The underlying material is stratified pale brown loamy sand and brown and very pale brown loamy fine sand to a depth of 60 inches or more. This soil commonly is strongly alkaline.

The Bluepoint soil has rapid permeability, and available water capacity is moderately low. Observed rooting depth is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 5 to 8 inches. Surface runoff is slow. The hazard of soil blowing is high and that of water erosion is slight.

The Gothard fine sandy loam is very deep and moderately well drained. It formed in old lake and fan deposited alluvium from mixed sources. Typically, the surface layer is very pale brown fine sandy loam about 2 inches thick. The subsoil is light brown and very pale brown sandy clay loam to a depth of about 22 inches. The substratum is stratified light brownish gray sandy loam, very fine sandy loam, and loamy sand to a depth of 60 inches or more. This soil is saline and strongly alkaline, except in the surface layer.

The Gothard soil has slow permeability, and available water capacity is moderately low to moderate. Observed rooting depth is 24 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 8 inches. Surface runoff is slow. The hazard of soil blowing is high and that of water erosion is slight.

The soils in this complex are used mainly for livestock grazing. The present vegetation on the Bluepoint soil is mesquite, fourwing saltbush, and annuals. Proper management of the vegetation is designed to increase the production of fourwing saltbush, spike and mesa dropseed, and bush muhly. The present vegetation on the Gothard soil is alkali sacaton and fourwing, desert, and mount saltbush. Proper management of the vegetation is designed to increase the production of the alkali sacaton and fourwing saltbush.

Grazing management that maintains the plant cover on these soils is very important. Soil blowing is a hazard. The surface has dunes or is hummocky because of windblown material deposited around the base of shrubs. Building fences and developing water sources are necessary to help in distribution of grazing.

On Bluepoint soils, plants green up very early in spring even though rainfall is scant. To allow plant growth, livestock should be restricted at that time. Management of brush is required on deteriorated range. Plants on Bluepoint soils are fragile and quickly deteriorate unless management is geared to plant needs.

The Gothard soil has a dispersed subsoil that is high in sodium, and for plants to become established, it is important that the surface layer not be eroded. Only alkali-tolerant plants grow on the Gothard soil, and about 50 percent of the area is barren because of the exposed subsoil.

Controlling grazing and developing water sources help in managing wildlife habitat.

This complex is in capability subclass VIIe.

**8—Bonita cobbly silty clay.** This very deep and well drained soil is on high fans. Elevation ranges from 3,500 to 5,000 feet (fig. 5). This soil formed in residuum and alluvium from basalt, ash, and andesite. Average annual precipitation is about 12 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 220 days. Slope ranges from 2 to 8 percent.

Bonita cobbly silty clay makes up 70 percent of this map unit. Included with this soil in mapping are 10 percent Bonita cobbly clay loam and 20 percent Hantz, Cave, and Tres Hermanos soils and soils that are similar to this Bonita soil but have weak subsoil development.

Typically, the upper part of the surface layer is brown cobbly silty clay about 3 inches thick, and the lower part is dark brown clay about 8 inches thick. The underlying material is reddish brown and brown clay to a depth of about 38 inches and brown very gravelly clay to a depth of 55 inches or more. This soil cracks widely and deeply upon drying.

Permeability is very slow, and available water capacity is high. Observed rooting depth is 30 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is slow when dry and moderate when moist. The hazards of soil blowing and water erosion are slight to moderate.

This soil is used mainly for livestock grazing. Present vegetation is tobosa, vine-mesquite, creosotebush, cacti, and bluedicks. Proper management of the vegetation is designed to increase the production of vine-mesquite and tobosa.

Grazing management that maintains the plant cover is desirable. Grazing should be scheduled so that livestock utilize the forage when it is most palatable. Grazing in areas should be intensive for short periods following summer rains. The areas should be rested for 1 year out of every 3 or 4, depending on the amount of water available and on forage production.

Controlling grazing and developing water sources help in managing wildlife habitat.

This soil is in capability subclass VIe.

**9—Bucklebar fine sandy loam.** This very deep and well drained soil is on terraces. Elevation ranges from 3,500 to 4,200 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent on rangeland and 0 to 1 percent in cultivated areas.

Bucklebar fine sandy loam makes up 85 percent of this map unit. Included with this soil in mapping are small areas of Sonoita fine sandy loam, Tubac sandy clay loam, and Pima silt loam.

Typically, the surface layer is brown fine sandy loam 1 inch thick. The subsoil is reddish brown sandy clay loam and yellowish red sandy clay loam to a depth of 38 inches. The substratum is light reddish brown sandy loam to a depth of 52 inches or more. If the soil is cultivated, the surface layer is brown heavy fine sandy loam about 10 inches thick.

Permeability is moderate, and available water capacity is high. Observed rooting depth on rangeland is 15 inches, and potential rooting depth is 52 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is medium to slow. The hazard of soil blowing is moderate and that of water erosion is slight to moderate.

About half of the acreage of this soil is used for livestock grazing. The present vegetation is mesquite, burroweed, perennial broomweed, condalia, and Mormon-tea. Proper management of the vegetation is designed to increase the production of bush muhly, sand dropseed, black grama, and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Soil blowing is a hazard. The surface is hummocky because of deposition of material around the base of shrubs. Building fences and developing water sources are necessary to help in distribution of grazing. Management of brush helps improve some deteriorated range. Seeding of adapted species of plants is needed.

About half of the acreage of this soil is irrigated and cropped. Grain sorghum, cotton, and alfalfa are the main crops. This soil is well suited to the crops commonly grown in the survey area.

A rotation that contains a soil-building crop should be considered. Organic matter can be added and soil blowing can be reduced by returning crop residue and using green-manure crops. Minimum tillage and variable depth of plowing help to avoid forming a plowpan.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat.

This soil is in capability subclass VIe, dryland, and capability unit I-2, irrigated.

**10—Calciorthids and Torriorthents, eroded.** This undifferentiated group is made up of soils that have a rough broken land appearance on low hills. Elevation ranges from 3,200 to 4,000 feet. Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope ranges from 2 to 58 percent.

Calciorthids make up 35 percent of the map unit, and Torriorthents make up about 25 percent. These soils are intermingled in some areas, and in other areas they are separate. They are in many positions on the landscape. Calciorthids are loamy and have layers of lime and silica accumulation and are cemented in places. Torriorthents are stratified and have textures ranging from loamy sand to clay.

Included with these soils in mapping is 20 percent barren and exposed geologic material. This material is made up of sandstone and siltstone that may or may not have a cemented sandstone cap. Also included are small areas of Tres Hermanos, Anthony, and Gila soils.

The soils in this unit are variable in texture and other characteristics. They formed in old lacustrine deposits and in the material eroded from those deposits. They are commonly saline and strongly alkaline in some part of the profile.

Permeability and available water capacity in these soils are variable. The water supplying capacity is 2 to 4 inches. Surface runoff and sediment production are high. The hazard of soil blowing is moderate and that of water erosion is high.

These soils are used mainly for livestock grazing. Forage production is low, but the vegetation consists of a wide variety of drought-tolerant plants. Examples of these plants are shadscale, fourwing and desert saltbush, tobosa, ratany, turkshead, ocotillo, Mormon-tea, desert zinnia, fluffgrass, burroweed, and annuals.

Calciorthids and Torriorthents are better used when managed with areas of the adjacent and included soils, since they contribute runoff to those areas.

Controlling grazing and developing water sources are good management for wildlife habitat. Some areas of this map unit are used for mining diatomaceous earth, where this material is exposed at the land surface.

This undifferentiated group is in capability subclass VIIe.

**11—Cave-Durorthids complex.** These nearly level to moderately sloping soils are on old high alluvial fans. Elevation ranges from 3,500 to 4,500 feet (fig. 6). Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope is dominantly 0 to 8 percent but ranges to 20 percent on breaks.

Cave gravelly loam makes up about 50 percent of this map unit, and Durorthids make up about 30 percent. These soils are intermingled with Cave soils on fans below mountains where basalt is dominant and with durorthids on fans below mountains where ash and tuff are dominant. Included with these soils in mapping are small areas of Artesia, Bonita, Tres Hermanos, and Arizo soils and small areas of Rock outcrop.

The Cave gravelly loam is shallow and well drained. It formed in old alluvium from mixed sources. Typically, the surface layer is light brown gravelly loam about 11 inches thick. The underlying material is a white, lime-cemented pan about 3 inches thick over white very gravelly sandy loam to a depth of 48 inches or more.

Permeability is moderate above the pan, and available water capacity is low. Observed rooting depth is about 11 inches, and potential rooting depth is to the pan. The water supplying capacity is 5 to 7 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is slight to moderate.

Durorthids are shallow to moderately deep. They formed in old alluvium from mixed sources. They are similar in all characteristics to the Cave soil, except they have a silica-cemented layer and the pan is at a different depth.

The soils in this complex are mainly used for livestock grazing. The present vegetation is creosotebush, bush muhly, and annuals. Proper management of the vegetation is designed to increase the production of bush muhly.

Grazing management that maintains the plant cover is desirable. Developing water sources and building fences are important in planning grazing systems.

Controlling grazing and developing water sources help in managing wildlife habitat.

This complex is in capability subclass VIIe.

**12—Comoro soils.** This undifferentiated group is made up of nearly level to gently sloping soils on alluvial fans and terraces. Elevation ranges from 3,500 to 5,200 feet (fig. 7). Average annual precipitation ranges from 10 inches to about 13 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 200 days. Slope is 0 to 5 percent.

Comoro fine sandy loam, Comoro gravelly sandy loam, and Comoro sandy loam are nearly equal in extent and make up 80 percent of this map unit. Included with these soils in mapping are small areas of White House, Eba, Santo Tomas, and Grabe soils.

The Comoro soils are very deep and well drained. They formed in alluvium and colluvium from dominantly acid igneous rock and some limestone. Typically, the upper part of the surface layer is brown fine sandy loam, gravelly sandy loam, or sandy loam about 2 inches thick. The lower part of the surface layer is grayish brown fine sandy loam about 8 inches thick. The underlying material is stratified grayish brown gravelly fine sandy loam and brown and pale brown fine sandy loam to a depth of 60 inches or more.

Permeability is moderately rapid, and available water capacity is moderate. Observed rooting depth is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 9 to 12 inches. Surface runoff is medium. The hazard of soil blowing is moderate and that of water erosion is slight.

The Comoro soils in this unit are used mainly for livestock grazing. The present vegetation is mesquite, yucca, graythorn, and perennial broomweed. Proper management of the vegetation is designed to increase the production of black grama, bush muhly, Arizona cottontop, and plains bristlegrass. In some areas of higher precipitation, the present vegetation is blue and sideoats grama, cane beardgrass, and yucca. Proper management of the vegetation is designed to increase the production of sideoats, black, and blue gramas and cane beardgrass.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are needed to help in distribution of grazing. Management of brush helps improve deteriorated range. Seeding of adapted species of plants is needed.

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover and food help in managing wildlife habitat.

These soils are in capability subclass VIe.

**13—Continental-Tubac complex.** These nearly level to strongly sloping soils are on alluvial fans and terraces that extend from the Pinaleno Mountains. Elevation ranges from 3,400 to 5,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 220 days. Slope is 8 to 15 percent.

Continental gravelly sandy loam makes up about 40 percent of this unit, and Tubac gravelly sandy loam makes up about 40 percent. These soils are intermingled with the gently sloping to strongly sloping Continental gravelly sandy loam on side slopes and the nearly level Tubac gravelly sandy loam on interfluves. Included with these soils in mapping are small areas of Sonoita, Santo Tomas, and Anthony soils and small areas of Rock outcrop.

The Continental gravelly sandy loam is very deep and well drained. It formed in old alluvium from dominantly acid igneous rock. Typically, the surface layer is brown gravelly sandy loam about 4 inches thick. The upper part of the subsoil is reddish brown and yellowish red gravelly clay and gravelly sandy clay to a depth of about 35 inches. The lower part of the subsoil is reddish brown and yellowish sandy clay loam to a depth of about 46 inches. The substratum is reddish yellow gravelly fine sandy loam to a depth of 60 inches or more.

The Continental soil has slow permeability, and available water capacity is high. Observed rooting depth is 22 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate.

The Tubac gravelly sandy loam is very deep and well drained. It formed in old alluvium from dominantly acid igneous rock. Typically, the surface layer is light reddish brown gravelly sandy loam about 4 inches thick. The subsurface layer is light brown gravelly loam about 8 inches thick. The upper part of the subsoil is reddish brown clay to a depth of about 36 inches. The lower part of the subsoil is reddish yellow and reddish brown clay loam to a depth of 48 inches or more.

The Tubac soil has slow permeability, and available water capacity is high. Observed rooting depth is 25 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is medium. The hazards of soil blowing and water erosion are slight.

The soils in this complex are used mainly for livestock grazing. The present vegetation on the Continental soil is mesquite, catclaw, Mormon-tea, perennial broomweed, and cacti. Proper management of the vegetation is designed to increase the production of black grama, Arizona cottontop, cane beardgrass, and plains bristlegrass. The present vegetation on the Tubac soil is mesquite, catclaw, tobosa, and cacti. Proper management of the vegetation is designed to increase the production of black grama, plains bristlegrass, bush muhly, and sideoats grama.

Grazing management that maintains the plant cover is desirable. For grazing, livestock prefer areas of this map unit. Developing water sources and building fences are important in planning grazing systems. Management of the brush and pitting help improve some deteriorated range. The soils in this complex are favorable for seeding.

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover help in managing wildlife habitat.

This complex is in capability subclass VIe.

**14—Dona Ana fine sandy loam, 0 to 2 percent slopes.** This very deep and well drained soil is on terraces. Elevation ranges from 3,500 to 4,200 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 210 days. Slope is 0 to 2 percent on rangeland and 0 to 1 percent where the soil is cultivated.

The Dona Ana soil makes up about 85 percent of this map unit. Included with this soil in mapping are small areas of Vekol loam, Tres Hermanos gravelly loam, Bucklebar fine sandy loam, Glendale silty clay loam, and Pima silt loam.

Typically, the surface layer is light brown fine sandy loam about 3 inches thick. The subsoil is brown loam to a depth of about 25 inches. The substratum is pinkish white and light brown or pinkish gray loam and has accumulated lime to a depth of 60 inches or more. Local areas have a surface texture of loam or sandy clay loam.

Permeability is moderate, and the available water capacity is high. Observed rooting depth on rangeland is 37 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is medium. The hazard of soil blowing is moderate and that of water erosion is slight.

About half of the acreage of this soil is used for livestock grazing. The present vegetation is creosotebush, bush muhly, mesquite, and sand dropseed. Proper management of the vegetation is designed to increase the production of bush muhly, black grama, and trichloris.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are necessary to assist in distribution of grazing. Management of the brush helps improve deteriorated range. Seeding adapted species of plants is needed.

About half of the acreage of this soil is irrigated and cropped. Grain sorghum, cotton, and barley are the main crops. This soil is well suited to the crops commonly grown in the survey area.

A rotation that contains a soil-building crop should be considered. Organic matter can be added and soil blowing can be reduced by returning crop residue and using green-manure crops. Addition of organic material is especially important where land leveling has exposed the limy layer at a depth of 20 to 40 inches. When grain sorghum or fruit trees are grown in areas where the limy layer is exposed, additional applications of nitrogen and iron are necessary for healthy plant growth. Adding sulfuric acid to irrigation water is being researched in selected areas.

Minimum tillage and variable depths of plowing are needed to avoid forming a plowpan. Special attention to intervals between irrigations and amounts of water applied is important.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in openland wildlife habitat.

This soil is in capability subclass VIc, dryland, and capability unit I-2, irrigated.

**15—Dona Ana fine sandy loam, 0 to 5 percent slopes.** This very deep and well drained soil is on alluvial terraces and fans. Elevation ranges from 3,400 to 4,800 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days.

Dona Ana fine sandy loam makes up about 80 percent of this map unit. Included with this soil in mapping are small areas of Tres Hermanos, Continental, Hondale, and Anthony soils. Also included are localized areas of soils that are similar to Cave soils but have caliche fragments on the surface and may or may not have a lime-cemented pan at a shallow depth. Included soils make up about 20 percent of this unit.

Typically, the surface layer is light brown fine sandy loam about 3 inches thick. The subsoil is brown loam to a depth of about 25 inches. The substratum is pinkish white, light brown, and pinkish gray loam that has accumulated lime to a depth of 60 inches or more. This soil is generally calcareous throughout.

Permeability is moderate, and available water capacity is moderate to high. Observed rooting depth is 37 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is medium. The hazard of soil blowing is moderate and that of water erosion is moderate to slight, depending on slopes.

This soil is used mainly for livestock grazing. The present vegetation is creosotebush, mesquite, bush muhly, and in some places tarbush, fourwing saltbush, and dropseed. Proper management of the vegetation is designed to increase the production of bush muhly, black grama, trichloris, and in some places, fourwing saltbush.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are necessary to assist in distribution of grazing. Management of the brush helps improve deteriorated range.

Controlling grazing and developing water sources help in managing wildlife habitat. Saltbush and other desirable brush should be left in areas to provide food and cover.

This soil is in capability subclass VIe.

**16—Eba gravelly sandy loam.** This very deep and well drained soil is on high alluvial fans and terraces. Elevation ranges from 3,500 to 5,200 feet (fig. 8). This soil formed in old alluvium from mixed sources. Average annual precipitation is about 11 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 220 days. Slope is 2 to 8 percent.

The Eba soil makes up about 70 percent of this map unit. Included with this soil in mapping are small areas of Tubac, Forrest, White House, Artesia, and Santo Tomas soils. Included soils make up about 30 percent of the unit.

Typically, the surface layer is brown gravelly sandy loam about 3 inches thick. The upper part of the subsoil is reddish brown very gravelly sandy clay loam to a depth of about 15 inches. The lower part of the subsoil is yellowish red very gravelly clay to a depth of about 33 inches. The substratum to a depth of 56 inches or more is pinkish white and reddish yellow very gravelly loam and has a layer of lime accumulation.

Permeability is slow, and available water capacity is moderately low. Observed rooting depth is 33 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 10 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate to slight depending on slopes.

This soil is used mainly for livestock grazing. The present vegetation is catclaw, whitethorn, tobosa, mesquite, tarbush, bush muhly, and Mormon-tea. Proper management of the vegetation is designed to increase the production of bush muhly and black, blue, and hairy gramas.

Grazing management that maintains the plant cover is desirable. For grazing, livestock prefer areas of this soil. Developing water sources and building fences are important in planning grazing systems. Management of the brush and pitting help improve deteriorated range. This soil is favorable for seeding.

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover help in managing wildlife habitat.

This soil is in capability subclass VIe.

**17—Eba gravelly fine sandy loam.** This very deep and well drained soil is on terraces. Elevation ranges from 3,800 to 4,400 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope is 0 to 5 percent on rangeland and 0 to 2 percent where the soil is cultivated.

Eba soils make up about 85 percent of this map unit. Included with this soil in mapping are small areas of Tubac gravelly loam, Continental gravelly sandy loam, Santo Tomas cobbly fine sandy loam, and Comoro soils.

Typically, the surface is brown gravelly fine sandy loam about 3 inches thick. The upper part of the subsoil is reddish brown very gravelly sandy clay loam to a depth of about 15 inches. The lower part of the subsoil is yellowish red very gravelly clay to a depth of 33 inches. The substratum to a depth of 56 inches or more is pinkish white and reddish yellow very gravelly loam and has a zone of lime accumulation. Where the soil is irrigated, the surface layer can be gravelly loam or gravelly clay loam.

Permeability is slow, and available water capacity is moderately low. Observed rooting depth on rangeland is 26 inches, and potential rooting depth is 56 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is medium, and the hazard of water erosion is moderate.

About half of the acreage of this soil is used for livestock grazing. The present vegetation is creosotebush, mesquite, catclaw, tarbush, tobosa, and bush muhly. Proper management of the vegetation is designed to increase the production of bush muhly, black grama, sideoats grama, and cane beardgrass.

Grazing management that maintains the plant cover is desirable. Grazing systems that include developing water sources and building fences are beneficial. Management of the brush helps improve deteriorated range. Seeding adapted species of plants is needed.

About half of the acreage of this soil is irrigated and cropped. Alfalfa is the main crop. This soil is not well suited to the crops commonly grown in the survey area because of the content of gravel and cobbles in the profile. Where the soil is cropped, the surface gravel and cobbles have been removed and piled in other areas. Alfalfa is grown because less tillage is required.

Soil tests should be made regularly to determine nutrient availability, and fertilizers should be added if there are deficiencies. Special attention to intervals between irrigations and amounts of water supplied is important.

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover help in managing wildlife habitat.

This soil is in capability subclass VIe, dryland, and capability unit IIIs-8, irrigated.

**18—Faraway-Rock outcrop complex.** This moderately steep to very steep soil and Rock outcrop are on mountains. Elevation ranges from 5,200 to 8,363 feet. Average annual precipitation is about 18 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 150 days. Slope is dominantly 30 to 60 percent but, in places, ranges from 20 to 70 percent.

Faraway very cobbly loam makes up about 55 percent of this map unit, and Rock outcrop makes up 25 percent. This soil and Rock outcrop are intermingled with the Faraway soils on side slopes between the areas of Rock outcrop. Included with this complex in mapping are small areas of Mokiak soils, shallow soils over limestone, and moderately deep soils that have a clay subsoil on ridges.

The Faraway very cobbly loam is shallow and well drained. It formed in residuum from rhyolite, andesite, and related rocks. Typically, the surface layer is grayish brown very cobbly loam about 10 inches thick. The underlying material is light gray fractured rhyolite to a depth of about 18 inches. Hard rhyolite is at a depth of 18 inches.

Permeability is moderate above the bedrock, and available water capacity is low. Observed rooting depth is 10 inches, and potential rooting depth is to bedrock. The water supplying capacity is 12 to 14 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly rhyolite and andesite. It provides concealment for wildlife.

This complex is used for livestock grazing, wildlife habitat, and recreation. The present vegetation is plains lovegrass, sideoats grama, oak, and juniper. Proper management of the vegetation is designed to increase the production of sideoats grama, plains lovegrass, and cane beardgrass.

Grazing management that maintains a mixed cover of grass and brush is desirable. Developing water sources and building fences are important in planning grazing systems. Limited numbers of potholes, springs, and seeps are present naturally in this map unit.

Controlling grazing and having a balance among shrubs, forbs, and grass for food and cover help in managing wildlife habitat.

This unit has aesthetic appeal because of its rugged appearance and variety of plants. Popular recreation activities include hiking and wildlife observation.

This complex is in capability subclass VIIs.

**19—Forrest-White House-Kimbrough complex.** These gently sloping to strongly sloping soils are on old high dessected alluvial fans. Elevation ranges from 4,500 to 5,400 feet. Average annual precipitation is about 14 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 200 days. Slope is 2 to 15 percent.

Forrest soils make up about 40 percent of this map unit, White House soils make up 25 percent, and Kimbrough soils make up 20 percent. These soils are intermingled with moderately sloping to strongly sloping Forrest and White House soils on higher fans and with gently sloping to moderately sloping Kimbrough soils on lower fans. Included with these soils in mapping are small areas of Comoro, Grabe, and Pima soils and small areas of Rock outcrop.

The Forrest soils are very deep and well drained. They formed in old alluvium from igneous rock and limestone. Typically, the surface layer is brown gravelly loam about 2 inches thick. The subsoil is reddish brown clay and gravelly clay, yellowish red clay, and excessively limy brown clay to a depth of about 38 inches. The substratum to a depth of 54 inches or more is brown and light brown clay loam. It has a zone of lime accumulation.

The Forrest soils have slow permeability, and available water capacity is high. Observed rooting depth is 26 inches, and potential rooting depth is 54 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium to slow. The hazards of soil blowing and water erosion are slight.

The White House gravelly loam is very deep and well drained. It formed in old alluvium from dominantly igneous rock and some limestone. Typically, the surface layer is brown gravelly loam about 2 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay to a depth of about 28 inches. The lower part of the subsoil is yellowish red gravelly clay to a depth of 50 inches or more.

The White House soil has slow permeability, and available water capacity is high. Observed rooting depth is 28 inches, and potential rooting depth is 50 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate.

The Kimbrough soil is shallow and well drained. It formed in old alluvium from limestone and some igneous rock. Typically, the surface layer is brown gravelly loam about 14 inches thick. The underlying material is a white, lime-cemented pan.

The Kimbrough soil has moderate permeability above the pan, and available water capacity is low. Observed rooting depth is 14 inches, and potential rooting depth is to the pan. The water supplying capacity is 10 to 12 inches. Surface runoff is slow to medium. The hazards of soil blowing and water erosion are slight.

The soils in this complex are used mainly for livestock grazing. The present vegetation is similar on the Forrest and White House soils because of their surface layers and their fine textured subsoils. The vegetation consists of grama grasses, tobosa, cane beardgrass, and mesquite. The present vegetation on the Kimbrough soil is grama grasses, winterfat, and cane beardgrass. Proper management of the vegetation is designed to increase the production of sideoats, black, blue, and hairy gramas; cane beardgrass; Arizona cottontop; and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. For grazing, livestock prefer areas of this unit. Developing water sources and building fences are important in planning grazing systems. Management of the brush and pitting on the Forrest and White House soils help improve deteriorated range.

Controlling grazing, developing water sources, and leaving some brush for use as cover in associated swales and drainageways help in managing wildlife habitat.

This complex is in capability subclass VIe.

**20—Gila loam.** This very deep and well drained soil is on flood plains and alluvial fans. Elevation ranges from 3,100 to 4,000 feet. This soil formed in recent alluvium from mixed sources. Average annual precipitation is about 9 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent.

Gila loam makes up 70 percent of this map unit. Included with this soil in mapping are small areas of Gila fine sandy loam and very fine sandy loam. Also included are small areas of Anthony and Glendale soils and localized areas of soils that are saline and alkali.

Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of fine sandy loam to a depth of 60 inches or more.

Permeability is moderate, and available water capacity is high. Observed rooting depth is 14 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 10 inches. Surface runoff is medium to slow. The hazard of soil blowing is moderate. This soil is subject to piping and gully erosion, and where grades are not stabilized, the hazards of headcutting and sediment production are high.

This soil is mainly used for livestock grazing. The present vegetation is creosotebush, bush muhly, alkali sacaton, and fourwing saltbush. Some areas are on uplands and do not receive runoff, thus the potential plant production is less.

Grazing management that maintains the plant cover is important. Developing water sources and building fences are important in planning grazing systems. Management of the brush and pitting help improve deteriorated range. Seeding adapted species of plants is needed. Erosion control structures are needed in some areas.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing wildlife habitat.

This soil is in capability subclass VIe.

**21—Gila-Anthony-Bluepoint complex.** These nearly level to undulating soils are on flood plains and alluvial fans and terraces. Elevation ranges from 3,200 to 4,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is dominantly 0 to 3 percent but, in places, ranges to 8 percent.

Gila loam makes up about 35 percent of this map unit, Anthony sandy loam makes up 25 percent, and Bluepoint loamy sand makes up 25 percent. These soils are intermingled with the Gila soils in small drainageways, the Anthony soils on interfluves, and the Bluepoint soils on higher fans and dunes. Included with these soils in mapping are small areas of Glendale soils; Calciorthids and Torriorthents, eroded; and localized areas of soil that are saline and alkali.

The Gila loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of fine sandy loam to a depth of 60 inches or more.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth is 14 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 10 inches. Surface runoff is medium. The hazards of soil blowing and water erosion are moderate.

The Anthony sandy loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is stratified light yellowish brown sandy loam, gravelly sandy loam, and fine sandy loam to a depth of 60 inches or more.

The Anthony soil has moderately rapid permeability, and available water capacity is moderate. Observed rooting depth is 35 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 8 inches. Surface runoff is slow. The hazard of soil blowing is moderate and that of water erosion is slight.

The Bluepoint loamy sand is very deep and somewhat excessively drained. It formed in recent alluvium and windblown material from mixed sources. Typically, the surface layer is pale brown loamy sand about 2 inches thick. The underlying material is stratified pale brown loamy sand and brown, pale brown, or very pale brown loamy fine sand to a depth of 60 inches or more.

The Bluepoint soil has rapid permeability, and available water capacity is moderately low. Observed rooting depth is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 5 to 8 inches. Surface runoff is slow. The hazard of soil blowing is high and that of water erosion is slight.

The soils in this complex are used mainly for livestock grazing. The present vegetation on the Gila soil is mesquite, bush muhly, and creosotebush. Proper management of the vegetation is designed to increase the production of sacaton, cane beardgrass, alkali sacaton, and trichloris. The present vegetation on the Anthony soil is mesquite, yucca, bush muhly, and creosotebush. Proper management of the vegetation is designed to increase the production of bush muhly, plains bristlegrass, and black grama. The present vegetation on the Bluepoint soil is mesquite, yucca, and fourwing saltbush. Proper management of the vegetation is designed to increase the production of fourwing saltbush, spike and mesa dropseed, and bush muhly.

Grazing management that maintains the plant cover is important. Developing water sources and building fences are important in planning grazing systems. Management of the brush on all the soils and pitting on the Gila soil help improve some deteriorated ranges. Seeding adapted species of plants is needed.

Controlling grazing, developing water sources, and leaving brush for use as food and cover help in managing wildlife habitat.

This complex is in capability subclass VIe.

**22—Glendale-Gila complex.** These nearly level soils are on flood plains and alluvial fans. Elevation ranges from 3,400 to 4,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 215 days. Slope is 0 to 2 percent on rangeland and 0 to 1 percent where the soil is cultivated.

Glendale silty clay loam makes up 55 percent of this map unit, and Gila loam makes up 30 percent. These soils are intermingled with the Glendale soils on the lower parts of flood plains and with the Gila soils on the higher parts of flood plains and low terraces.

Included with these soils in mapping are small areas of Hondale fine sandy loam, Anthony sandy loam, and Hondale loam.

The Glendale silty clay loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown silty clay loam about 2 inches thick. The underlying material is stratified pale brown and very pale brown silty clay loam and silt loam to a depth of 60 inches or more.

The Glendale soil has moderately slow permeability, and available water capacity is high. Observed rooting depth on rangeland is 29 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 12 to 16 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight.

The Gila loam is very steep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of silt loam and fine sandy loam to a depth of 60 inches or more.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth on rangeland is 15 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is about 10 to 14 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 80 percent of the acreage of this unit is used for livestock grazing. The present vegetation is tobosa, mesquite, catclaw, vine-mesquite, fourwing saltbush, and in some places on the Gila soil, creosotebush and bush muhly. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, trichloris, cane beardgrass, and tobosa.

Grazing systems that include developing water sources and building fences should be designed so that livestock utilize forage when it is most palatable. Grazing the areas should be only for a short time. Grazing should be deferred for 1 year out of every 3 or 4, depending on the amount of water overflow and forage production. Other beneficial measures are management of brush and pitting if runoff is restricted to small channels or gullies. Seeding adapted species of plants is also needed.

About 20 percent of the acreage of this unit is irrigated and cropped. Grain sorghum and cotton are the main crops. The soils are well suited to crops commonly grown in the survey area.

A successful rotation system includes a soil-building crop. Organic matter is added by using crop residue and green-manure crops. Minimum tillage is desirable in order to maintain soil structure and to avoid compaction.

The Glendale soil is less permeable than the Gila soil, and this is a factor in the design of irrigation systems.

Controlling grazing and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat. A significant amount of water development is needed for wetland wildlife.

These soils are in capability subclass VIc, dryland, and capability unit, I-1, irrigated.

**23—Glendale-Gila complex, eroded.** These nearly level to gently sloping soils are on flood plains and alluvial fans. Elevation ranges from 3,020 to 4,000 feet (fig. 9). Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent.

Glendale silty clay loam makes up about 50 percent of this map unit, and Gila loam makes up 25 percent. These soils are intermingled with the Glendale soils on the lower parts of flood plains and with the Gila soils on the higher parts of flood plains and low alluvial fans.

Included with these soils in mapping are small areas of Anthony and Hantz soils, localized areas of soil that are saline and alkali, and riverwash materials in the San Simon River channel.

The Glendale silty clay loam is very deep and well drained. It formed in alluvium from mixed sources. Typically, the surface layer is pale brown silty clay loam about 2 inches thick. The underlying material is stratified pale brown or very pale brown silty clay loam and silt loam to a depth of 60 inches or more.

The Glendale soil has moderately slow permeability, and available water capacity is high. Observed rooting depth is 29 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 10 inches. Surface runoff is medium to slow. The hazard of soil blowing is moderate and that of water erosion is high.

The Gila loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material is pale brown loam that has thin strata of fine sandy loam to silt loam to a depth of 60 inches or more.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth is 14 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 8 inches. Surface runoff is medium. The hazard of soil blowing is moderate and that of water erosion is high.

In this complex, gullies and arroyos that range to more than 30 feet in depth are evidence that there is a moderate to high hazard of erosion. The soils are subject to piping, and where grades are not stabilized, the hazards of headcutting and sediment production are high.

The soils in this complex are mainly used for livestock grazing. The present vegetation is creosotebush, and in the river channel, is saltbush with some mesquite and salt cedar. In conjunction with erosion control, proper management of the vegetation is designed to increase the production of sacaton, trichloris, cane beardgrass, fourwing saltbush, and tobosa.

Grazing management that maintains the plant cover is important. Developing water sources and building fences are important in planning grazing systems. Erosion control structures are necessary in some areas. Seeding adapted species of plants is needed.

Controlling grazing, developing water sources, controlling erosion, and leaving some brush for use as cover help in managing wildlife habitat.

This complex is in capability subclass VIe.

**24—Glendale-Gila association, frequently flooded.** This association is made up of nearly level soils on flood plains above the San Simon Fan Structure and other stabilized flood plains. Elevation ranges from 3,400 to 3,900 feet (fig. 10). Average annual precipitation is about 9 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 2 percent.

This association is about 55 percent Glendale silty clay loam and 30 percent Gila loam. The Glendale soil is on the lower parts of flood plains, and the Gila soil is on the higher parts of flood plains.

Included with these soils in mapping are small areas of Hantz and Anthony soils, and a dark, fine textured soil is included near San Simon Cienega.

The Glendale silty clay loam is very deep and well drained. It formed in alluvium from mixed sources. Typically, the surface layer is pale brown silty clay loam about 2 inches thick. The underlying material to a depth of 60 inches or more is stratified pale brown and very pale brown silty clay loam and silt loam.

The Glendale soil has moderately slow permeability, and available water capacity is high. Observed rooting depth and potential rooting depth are 60 inches or more. The water supplying capacity is 16 to 20 inches or more. It consists of precipitation and of the runoff from upstream areas. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to frequent flooding.

The Gila loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is pale brown loam about 4 inches thick. The underlying material to a depth of 60 inches or more is pale brown loam that has thin strata of silt loam to fine sandy loam.

The Gila soil has moderate permeability, and available water capacity is high. Observed rooting depth and potential rooting depth are 60 inches or more. The water supplying capacity is 12 to 20 inches or more. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to frequent flooding.

The soils in this association are used for livestock grazing and wildlife habitat. The present vegetation on both soils is tobosa, vine-mesquite, trichloris, mesquite, and fourwing saltbush. Proper management of the vegetation is designed to increase the production of sacaton, trichloris, cane beardgrass, fourwing saltbush, and tobosa.

Grazing systems that include developing water and building fences are beneficial. Another beneficial measure is brush management. Seeding of adapted species of plants is needed.

Controlling grazing and developing sources of water help in managing wildlife habitat.

This association is in capability subclass VIw.

**25—Graham-Rock outcrop complex.** This strongly sloping to steep soil and Rock outcrop are on mountains and hills. Elevation ranges from 3,500 to 5,500 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 61 degrees F, and average frost-free period is about 200 days. Slope is dominantly 15 to 30 percent but, in places, ranges from 9 to 45 percent.

Graham cobbly clay loam makes up about 65 percent of this map unit, and Rock outcrop makes up 15 percent. This soil and the Rock outcrop are intermingled with Graham soils on side slopes between areas of Rock outcrop.

Included with this unit in mapping are small areas of Atascosa and Cave soils and talus slopes.

The Graham cobbly clay loam is shallow and well drained. It formed in residuum from basalt and some andesite. Typically, the surface layer is brown cobbly clay loam about 2 inches thick. The subsoil is reddish brown gravelly clay about 11 inches thick. The substratum is fractured basalt with lime accumulation about 4 inches thick. Hard basalt is at a depth of 17 inches.

Permeability is slow, and available water capacity is low. Observed rooting depth is 13 inches, and potential rooting depth is to bedrock. The water supplying capacity is 8 to 10 inches. Surface runoff is slow. The hazards of soil blowing and water erosion are slight.

Rock outcrop is more than 90 percent exposed bedrock, mainly basalt and andesite. It provides concealment for wildlife.

This complex is used for livestock grazing, wildlife habitat, and recreation. The present vegetation is tobosa, catclaw, cacti, and perennial broomweed. Proper management of the vegetation is designed to increase the production of black and sideoats gramas, cane beardgrass, and Arizona cottontop.

Grazing management that maintains the plant cover is desirable. Building fences, developing water sources, and clearing trails are necessary to assist in distribution of grazing. Cobbles on the surface limit the use of the soil; however, the areas respond well if properly managed grazing systems are used.

Controlling grazing and developing water sources help in managing wildlife habitat.

The mountains in areas of this complex and the scattered juniper have aesthetic appeal, especially if the grass cover is good. Popular recreation activities are rock collecting and hunting.

This complex is in capability subclass VIs.

**26—Guest silty clay loam.** This very deep and well drained soil is on alluvial fans and flood plains. Elevation ranges from 3,500 to 4,400 feet (fig. 11). This soil formed in alluvium from mixed sources. Average annual precipitation is about 8 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is less than 1 percent.

Guest soils make up about 85 percent of the map unit. Included with this soil in mapping are small areas of Pima silt loam, Vekol loam, and Hondale silty clay loam.

Typically, the upper part of the surface layer is dark grayish brown silty clay loam about 7 inches thick, and the lower part is dark grayish brown clay about 10 inches thick. The underlying material is dark grayish brown silty clay to a depth of about 40 inches, and below this to a depth of 60 inches or more it is brown clay loam. Reaction is moderately alkaline to strongly alkaline, and a few gypsum crystals are below a depth of 26 inches in areas where this soil is associated with Hondale soils.

Permeability is slow, and available water capacity is high. Observed rooting depth on rangeland is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 15 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight.

About half of the acreage of this soil is used for livestock grazing. The present vegetation is tobosa, bush muhly, and vine-mesquite. Proper management of vegetation is designed to increase the production of vine-mesquite, tobosa, cane beardgrass, alkali sacaton, and in some places, fourwing saltbush.

Grazing should be managed so that livestock will utilize forage when it is most palatable. Building fences and developing water sources are needed for grazing distribution and proper range use.

About half of the acreage of this soil is irrigated and cropped. Grain sorghum, cotton, and barley are the main crops. This soil is better suited to alkali-tolerant crops than most other crops, but other crops can be grown if management is good. A successful rotation system includes a soil-building crop. Soil structure and tilth can be maintained and improved by returning crop residue and by using minimum tillage. Irrigation should be managed to attain adequate penetration of water into the slowly permeable subsoil.

Controlling grazing and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving brush along field borders to provide cover helps in managing openland wildlife habitat. Water impoundment is required for wetland wildlife habitat.

This soil is in capability subclass VIs, dryland, and capability unit IIIs-8, irrigated.

**27—Guest and Hantz soils.** This undifferentiated unit is made up of soils on flood plains and in swales. Elevation ranges from 3,500 to 5,200 feet. Average annual precipitation is about 13 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 220 days. Slope is 0 to 2 percent.

This map unit has about equal parts of Guest silty clay and Hantz silt loam. A mapped area may consist of both soils in variable percentages or of only one soil. The Guest soil is mostly in the southern part of the survey area, and the Hantz soil is in the northern part. The Guest soil is dark colored, and the Hantz soil is light colored.

Guest and Hantz soils make up about 90 percent of this map unit. Included with these soils in mapping are small areas of Pima and Glendale soils.

The Guest soil is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the upper part of the surface layer is dark grayish brown silty clay about 7 inches thick, and the lower part is dark grayish brown clay about 10 inches thick. The underlying material is dark grayish brown silty clay to a depth of about 40 inches. Below this is brown clay loam to a depth of 60 inches or more.

The Guest soil has slow permeability, and available water capacity is high. Observed rooting depth is 40 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 15 to 20 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight.

The Hantz soil is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the upper part of the surface layer is light brown silt loam about 4 inches thick, and the lower part is light brown silty clay loam about 3 inches thick. The underlying material is light reddish brown or reddish brown silty clay and clay to a depth of about 41 inches and pinkish gray gravelly silt loam to a depth of 60 inches or more.

The Hantz soil has very slow permeability, and available water capacity is high. Observed rooting depth is 35 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 14 to 20 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight.

The soils in this unit are used mainly for livestock grazing. The present vegetation on the Guest soil is tobosa, sideoats grama, and blue grama. Proper management of the vegetation is designed to increase the production of vine-mesquite, sideoats and blue gramas, and tobosa. The present vegetation on the Hantz soil is tobosa, mesquite, and some creosotebush. Proper management of the vegetation is designed to increase the production of vine-mesquite, cane beardgrass, tobosa, and fourwing saltbush.

These soils are in long narrow areas and are difficult to manage. Building fences and developing water sources are needed for grazing distribution and proper range use.

Controlling grazing and developing water sources help in managing wildlife habitat.

This map unit is in capability subclass VIs.

**28—Hondale silty clay loam.** This very deep and well drained soil is on alluvial terraces. Elevation ranges from 3,500 to 4,000 feet (fig. 12). This soil formed in old alluvium from mixed sources. Average annual precipitation is about 8 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is 0 to 2 percent on rangeland and 0 to 1 percent where the soil is cultivated.

Hondale soils make up about 85 percent of this map unit. Included with this soil in mapping are small areas of Vekol loam, Guest silty clay loam, and Glendale silty clay loam.

Typically, the surface layer is about 12 inches thick. The upper part of the surface layer is pale brown silty clay loam, and the lower part is brown silt loam. The subsoil is light brown or brown silty clay to a depth of about 35 inches. The substratum is pinkish gray silty clay loam and has a few fine crystals of gypsum to a depth of 60 inches or more. The subsoil and substratum are excessively high in lime. Reaction is moderately alkaline and strongly alkaline.

Permeability is very slow, and available water capacity is high. Observed rooting depth on rangeland is 35 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 10 inches. Surface runoff is slow, and the hazard of erosion is slight.

About half of the acreage of this soil is used for livestock grazing. The present vegetation is burrograss, alkali sacaton, fourwing saltbush, mesquite, and tobosa. Proper management of the vegetation is designed to increase the production of alkali sacaton, fourwing saltbush, and tobosa.

Grazing management that maintains the plant cover is desirable. Grazing systems that include building fences and developing water sources are needed to help in distribution of grazing.

About half of the acreage of this soil is irrigated and cultivated. Cotton, barley, grain sorghum, and alfalfa are the main crops. This soil is better suited to alkali-tolerant crops than most other crops. A successful rotation system includes a soil-building crop. Organic matter can be added by using crop residue and green manure crops. Minimum tillage reduces compaction and maintains soil structure.

This soil is excessively limy and is affected by alkali. Irrigation should be managed to attain adequate penetration of water into the very slowly permeable subsoil. When growing grain sorghum, fruit trees, lawns, or garden crops, applications of iron are necessary to maintain healthy plant growth.

Controlling grazing and developing water sources help in managing wildlife habitat.

This soil is in capability subclass VIs, dryland, and capability unit IVs-9, irrigated.

**29—Hondale complex.** This complex is made up of nearly level to gently sloping soils on alluvial terraces. Elevation ranges from 3,500 to 4,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent.

These Hondale soils are very deep and well drained. They formed in old alluvium from mixed sources. Hondale silt loam, loam, and fine sandy loam are nearly equal in extent, are intermingled, and make up about 75 percent of this map unit.

Included with these soils in mapping are small areas of Hantz, Glendale, and Dona Ana soils. Also included is a soil that is similar to Cave soil but has lime fragments on the surface and does not have a lime-cemented pan.

Typically, the surface layer of a Hondale soil is pale brown or very pale brown loam, silt loam, or fine sandy loam about 12 inches thick. The subsoil is light brown silty clay loam and silty clay to a depth of about 35 inches. The substratum is pinkish gray silty clay loam that has a few fine crystals of gypsum to a depth of 60 inches or more. The subsoil and substratum are excessively high in lime.

Permeability is very slow, and available water capacity is high. Observed rooting depth is 35 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 10 inches. Surface runoff is slow. The hazard of erosion is slight, but some areas have small subsidence cracks.

These Hondale soils are used mainly for livestock grazing. The present vegetation is burrograss, alkali sacaton, fourwing saltbush, mesquite, and tobosa. Proper management of the vegetation is designed to increase the production of alkali sacaton, fourwing saltbush, and tobosa.

Grazing management that maintains the plant cover is desirable. Grazing systems that include building fences and developing water sources are needed to help in distribution of grazing.

Controlling grazing and developing water sources help in managing wildlife habitat.

This complex is in capability subclass VIs.

**30—Kimbrough gravelly fine sandy loam.** This shallow and well drained soil is on high alluvial fans. Elevation ranges from 4,400 to 5,400 feet (fig. 13). This soil formed in old alluvium from limestone and some igneous rock. Average annual precipitation is about 12 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 200 days. Slope is 0 to 5 percent.

Kimbrough gravelly fine sandy loam makes up about 70 percent of this map unit. Included with this soil in mapping are 15 percent Kimbrough gravelly loam and 15 percent small areas of Santo Tomas, Comoro, and Eba soils and a soil that is similar to this Kimbrough soil but does not have the lime-cemented pan.

Typically, the upper part of the surface layer is brown gravelly fine sandy loam 3 inches thick, and the lower part is brown gravelly loam about 11 inches thick. A white, lime-cemented pan is at a depth of about 14 inches.

Permeability is moderate above the pan, and available water capacity is low. Observed rooting depth is 14 inches, and potential rooting depth is to the pan. The water supplying capacity is 9 to 11 inches. Surface runoff is slow to medium. The hazards of soil blowing and water erosion are slight.

This soil is used mainly for livestock grazing. The present vegetation is creosotebush, mariola, bush muhly, and fluffgrass. Proper management of the vegetation is designed to increase the production of black grama, bush muhly, and plains bristlegrass. In some areas of higher rainfall, the present vegetation is grama grasses, winterfat, and cane beardgrass. Proper management of the vegetation is designed to increase the production of sideoats, black, blue, and hairy gramas; cane beardgrass; Arizona cottontop; and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Grazing systems that include building fences and developing water sources are needed to help in distribution of grazing.

Controlling grazing and developing water sources help in managing wildlife habitat.

This soil is in capability subclass VIs.

**31—Mabray-Rock outcrop complex.** This complex is made up of a moderately steep to very steep soil and Rock outcrop on mountains and hills. Elevation ranges from 4,000 to 6,000 feet (fig. 14.). Average annual precipitation is 14 inches, average annual air temperature is about 60 degress F, and average frost-free period is about 190 days. Slope is dominantly 15 to 45 percent but, in places, ranges to 70 percent.

Mabray very gravelly loam makes up about 65 percent of this map unit, and Rock outcrop makes up 25 percent. The Mabray soil and the Rock outcrop are intermingled. The soil is on side slopes between the outcrops of rock. Included with this complex in mapping are small areas of Kimbrough and Santo Tomas soils.

The Mabray very gravelly loam is shallow and well drained. It formed in residuum from limestone. Typically, the surface layer is brown very gravelly loam about 12 inches thick. Underlying this is about 3 inches of black fractured limestone. Hard limestone is at a depth of 15 inches.

Permeability is moderate above the bedrock, and available water capacity is low. Observed rooting depth is 12 inches, and potential rooting depth is to bedrock. The water supplying capacity is 9 to 11 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly limestone. It provides concealment for wildlife.

This complex is used for livestock grazing, wildlife habitat, and recreation. The present vegetation is grama grasses, beargrass, ocotillo, and agave and at the higher elevations, juniper. Proper management of the vegetation is designed to increase the production of sideoats grama, black grama, cane beardgrass, and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Grazing systems that include building fences, clearing trails, and developing water sources are necessary to help in distribution of grazing.

Controlling grazing and developing water sources in adjacent areas help in managing wildlife habitat.

The mountains in areas of this complex have gray to black Rock outcrop and a variety of vegetation including cacti, shrubs, and grass. Popular recreation activities include wildlife observation, hiking, and hunting.

This complex is in capability subclass VIIs.

**32—Mokiak-Faraway-Rock outcrop complex.** These moderately steep to very steep soils and Rock outcrop are on mountains. Elevation ranges from 5,200 to 7,500 feet (fig. 15). Average annual precipitation is 16 inches, average annual air temperature is about 54 degrees F, and average frost-free period is about 160 days. Slope dominantly is 30 to 60 percent, but in places, ranges from 15 to 70 percent.

Mokiak cobbly sandy loam makes up about 50 percent of this map unit, Faraway very cobbly loam makes up 20 percent, and Rock outcrop makes up 15 percent. These soils and the Rock outcrop are intermingled with moderately steep to steep Mokiak soils between outcrops of granite and related rocks. The Faraway soil is steep to very steep, higher, and between outcrops of andesite or rhyolite.

Included with these soils in mapping are areas of gravelly and stony Mokiak soils, small areas of colluvial soils that are deeper than 40 inches, and shallow soils over fractured and tilted limestone.

The Mokiak cobbly sandy clay loam is moderately deep and well drained. It formed in residuum from granite and related rocks. Typically, the surface layer is dark grayish brown cobbly sandy clay loam about 4 inches thick. The subsoil is brown very gravelly sandy clay loam to a depth of 26 inches. The substratum to a depth of 30 inches is yellowish brown and light gray weathered granite that has clay films along the fractures. Below this is hard yellowish brown and light gray granite.

The Mokiak soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 26 inches, and potential rooting depth is to bedrock. The water supplying capacity is 12 to 14 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate.

The Faraway very cobbly loam is shallow and well drained. It formed in residuum from rhyolite, andesite, and related rocks. Typically, the surface layer is grayish brown very cobbly loam about 10 inches thick. The underlying material is light gray fractured rhyolite to a depth of 18 inches. Below this is hard rhyolite.

The Faraway soil has moderate permeability above the bedrock, and available water capacity is low. Observed rooting depth is 10 inches, and potential rooting depth is to bedrock. The water supplying capacity is 12 to 14 inches. Surface runoff is medium to rapid. The hazard of soil blowing is slight and that of water erosion is moderate.

Rock outcrop is more than 90 percent exposed bedrock, mainly granite and rhyolite. It provides concealment for wildlife and is used mainly for wildlife habitat and recreation.

The soils in this complex are used mainly for grazing, wildlife habitat, and recreation. The present vegetation on the Mokiak soil is sideoats grama, cane beardgrass, beargrass, mesquite, yucca, oak, juniper, and mountain-mahogany. Proper management of the vegetation is designed to increase the production of sideoats, blue, and hairy gramas; cane beardgrass; and Arizona cottontop. The present vegetation on the Faraway soil is black grama, plains lovegrass, juniper, and oak. Proper management of the vegetation is designed to increase the production of black grama, sideoats grama, plains lovegrass, and cane beardgrass.

Grazing management that maintains a mixed cover of dominantly grass and some brush is desirable. Livestock use the accessible parts of the area, and small rills may develop along trails. Developing water sources and building fences are important in grazing systems. Limited numbers of potholes, springs, and seeps are present in this complex.

Controlling grazing helps in managing wildlife habitat.

This unit, with its rugged appearance and variety of rocks and vegetation, provides aesthetic appeal. Popular recreation activities are rock hunting, hiking, wildlife observation, and hunting. Several old inactive mines are in areas of these soils, and some interest and exploration for minerals are continuous.

This complex is in capability subclass VIIs.

**33—Pima-Grabe silt loams.** These nearly level soils are on flood plains and alluvial fans. Elevation ranges from 3,400 to 4,000 feet. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent on rangeland and 0 to 1 percent where the soil is cultivated.

Pima silt loam makes up 65 percent of this map unit, and Grabe silt loam makes up 20 percent. These soils are intermingled with the Pima soils on the lower parts of flood plains and with the Grabe soils on low terraces between drainageways. Included with these soils in mapping are small areas of Comoro sandy loam, Tubac sandy clay loam, Bucklebar fine sandy loam, Dona Ana fine sandy loam, and Hondale silty clay loam.

The Pima silt loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown silt loam about 31 inches thick. The underlying material is silty clay loam to a depth of 60 inches or more.

The Pima soil has moderately slow permeability, and available water capacity is high. Observed rooting depth on rangeland is 28 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 12 to 16 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight. Floodwater is diverted from areas that are used for cropland. The areas in native rangeland receive occasional flooding.

The Grabe silt loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown silt loam about 24 inches thick. The underlying material is pale brown and brown loam to a depth of 60 inches or more.

The Grabe soil has moderate permeability, and available water capacity is high. Observed rooting depth on rangeland is 38 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 70 percent of the acreage of these soils is used for livestock grazing. The present vegetation is mesquite, tobosa, catclaw, perennial broomweed, and fourwing saltbush. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, trichloris, cane beardgrass, and tobosa.

Developing water sources and building fences are needed to help in distribution of grazing for proper range use. Management of the brush, pitting, and seeding on deteriorated range are also beneficial.

About 30 percent of the acreage of this map unit is irrigated and cropped. Cotton, grain sorghum, and alfalfa are the main crops grown. A few small orchards are on Pima silt loam. The soils in this unit are well suited to the crops commonly grown in the survey area and to other specialty crops.

A successful rotation includes a soil-building crop. Organic matter can be added by returning crop residue and using green-manure crops. Minimum tillage maintains soil structure and avoids compaction.

The Pima soil is less permeable than the Grabe soil, and this is a factor in the design of irrigation systems.

Controlling grazing and leaving some brush for use as cover help in managing wildlife habitat. Leaving brush along field borders to provide cover helps in managing openland wildlife habitat. A significant amount of water development is required for wetland wildlife habitat.

This map unit is in capability subclass VIc, dryland, and capability unit I-1, irrigated.

**34—Pima-Grabe association.** This association is made up of nearly level to gently sloping soils on flood plains and alluvial fans. Elevation ranges from 3,500 to 5,200 feet (fig. 16). Average annual precipitation is about 12 to 14 inches. Average annual air temperature is about 64 degrees F, and average frost-free period is about 210 days. Slope is 0 to 3 percent.

This association is about 55 percent Pima silt loam and 25 percent Grabe gravelly loam. The Pima soil is on the flood plains, and the Grabe soil is on the fans. Included with these soils in mapping are small areas of Comoro, Santo Tomas, and Tubac soils.

The Pima silt loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown silt loam about 8 inches thick. The underlying material to a depth of 60 inches or more is stratified brown silt loam and silty clay loam.

The Pima soil has moderately slow permeability, and available water capacity is high. Observed rooting depth is 60 inches or more. The water supplying capacity is 12 to 16 inches. It consists of precipitation and of the runoff from adjacent areas. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to frequent flooding.

The Grabe gravelly loam is very deep and well drained. It formed in recent alluvium from mixed sources. Typically, the surface layer is brown gravelly loam about 5 inches thick. The underlying material to a depth of 40 inches is brown gravelly loam, and below this to a depth of 60 inches or more it is yellowish brown gravelly loamy sand.

The Grabe soil has moderate permeability, and available water capacity is moderate to high. Observed rooting depth is 38 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 12 inches. Surface runoff is medium to slow, and the hazard of erosion is slight. This soil is subject to frequent flooding.

The soils in this association are mainly used for livestock grazing. The present vegetation on the Pima soil is sacaton and mesquite. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, and vine-mesquite. The present vegetation in included areas of lower rainfall is tobosa, mesquite, and catclaw. Proper management of the vegetation is designed to increase the production of sacaton, sideoats grama, trichloris, cane beardgrass, and tobosa. The present vegetation on the Grabe soil is grama grasses and cane beardgrass. Proper management of the vegetation is designed to increase the production of sideoats, black, and blue gramas and cane beardgrass. The present vegetation on included areas of lower rainfall is yucca, perennial broomweed, catclaw, mesquite, and Mormon-tea. Proper managment of the vegetation is designed to increase the production of black grama, bush muhly, and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Developing water sources and building fences are necessary for grazing distribution. Other beneficial practices are management of the brush, pitting, and seeding of deteriorated range.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing wildlife habitat.

This association is in capability subclass VIw.

**35—Pridham silty clay loam.** This very deep and somewhat poorly drained soil is on valley plains. Elevation ranges from 4,600 to 4,700 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is 13 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 210 days. Slope is 0 to 2 percent.

Pridham silty clay loam makes up 95 percent of this map unit. Included with this soil in mapping are small areas of Comoro and Tubac soils. Also included are seep areas that have as much as 4 inches of water on the surface.

Typically, the surface layer is gray silty clay loam about 1 inch thick. The subsoil is gray and light brownish gray silty clay to a depth of 29 inches. The substratum is mottled pale yellow, grayish brown, and light brownish gray clay to a depth of 60 inches or more. Surface gravel is present in local areas.

Permeability is slow, and available water capacity is high. Observed rooting depth is 29 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 16 to 20 inches from precipitation and seeps. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to occasional flooding for brief periods.

The Pridham soil is used mainly for livestock grazing. The present vegetation is tobosa, alkali sacaton, burroweed, and mesquite. Proper management of the vegetation is designed to increase the production of blue and hairy grama, alkali sacaton, and tobosa.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are needed for grazing distribution.

Controlling grazing and developing water sources help in managing wildlife habitat.

This soil is in capability subclass VIw.

**36—Santo Tomas soils.** This undifferentiated group is made up of nearly level to moderately sloping soils on high alluvial fans. Elevation ranges from 3,600 to 5,200 feet (fig. 17). Average annual precipitation is about 13 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 200 days. Slope is dominantly 2 to 6 percent, but in places, ranges to 8 percent.

The Santo Tomas soils are very deep and well drained. They formed in recent gravelly alluvium from mixed sources. Santo Tomas cobbly fine sandy loam and Santo Tomas very gravelly loam are about equal in extent and make up 65 percent of the mapping unit. Included with these soils in mapping are small areas of Arizo, Comoro, White House, and Eba soils.

Typically, the upper part of the surface layer of a Santo Tomas soil is grayish brown cobbly fine sandy loam or very gravelly loam about 2 inches thick. The lower part of the surface layer is brown gravelly loam and dark grayish brown very gravelly fine sandy loam about 34 inches thick. The underlying material is grayish brown very gravelly fine sandy loam to a depth of 60 inches or more.

Permeability is moderate, and available water capacity is moderately low. Observed rooting depth and potential rooting depth are 60 inches or more. The water supplying capacity is about 14 to 16 inches from rainfall and from runoff of adjacent areas. Surface runoff is medium except following a high intensity thundershower. The hazard of soil blowing is slight, and that of water erosion is slight to moderate. These soils are subject to rare flooding.

The soils in this unit are used for livestock grazing, wildlife habitat, and construction material. The vegetation varies, but includes sideoats grama, sacaton, plains lovegrass, Arizona cottontop, green spangletop, Apache plume, desert willow, and desert broom, and at higher elevations includes oak, sycamore, and Arizona walnut trees.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are necessary for distribution of grazing. Management of the brush and seeding are needed in areas that have deteriorated.

Controlling grazing and developing water sources help in managing wildlife habitat.

In the survey area, Santo Tomas soils are better than most other soils as a source of gravel and sand.

This map unit is in capability subclass VIe.

**37—Signal gravelly loam.** This very deep and well drained soil is on high dissected alluvial fans. Elevation ranges from 4,000 to 5,500 feet. This soil formed in old alluvium from mixed sources. Average annual precipitation is about 14 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 200 days. Slope is dominantly 5 to 15 percent, but in places it ranges from 2 to 30 percent.

Signal gravelly loam makes up 65 percent of this map unit. Included with this soil in mapping is 10 percent Signal cobbly loam; small areas of White House, Santo Tomas, Comoro, Grabe, and Pima soils; soils that are similar to this Signal soil but have less gravel in the subsoil; and localized areas of eroded soil in which the limy substratum is exposed.

Typically, the surface layer is dark grayish brown gravelly loam about 2 inches thick. The subsoil is dark brown very gravelly clay loam, reddish brown very gravelly clay, and reddish brown very gravelly sandy clay to a depth of about 32 inches. The substratum is brown and pink very gravelly sandy loam and strong brown very gravelly loamy sand to a depth of 60 inches or more.

Permeability is slow, and available water capacity is moderate. Observed rooting depth is 22 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 8 to 12 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is moderate.

This soil is used mainly for livestock grazing and wildlife habitat. The present vegetation is tobosa, catclaw, mesquite, grama grasses, and perennial broomweed. Proper management of the vegetation is designed to increase the production of sideoats and black grama, cane beardgrass, and bush muhly.

Grazing management that maintains the plant cover is important. Grazing systems that include building fences and developing water sources are needed for distribution of grazing.

Controlling grazing, developing water sources, and leaving some brush in associated drainageways for use as cover help in managing wildlife habitat.

This soil is in capability subclass VIe.

**38—Sonoita gravelly sandy loam.** This very deep and well drained soil is on alluvial fans and terraces. Elevation ranges from 3,200 to 5,000 feet. This soil formed in old alluvium from acid igneous rock and some limestone. Average annual precipitation is about 10 to 13 inches, mean annual air temperature is about 64 degrees F, and frost-free period is about 220 days. Slope is 0 to 5 percent.

Sonoita gravelly sandy loam makes up 75 percent of this map unit. Included with this soil in mapping are Sonoita sandy loam and small areas of Continental, Tubac, Comoro, and Gila soils. Included soils make up 25 percent of the map unit.

Typically, the surface layer is light reddish brown gravelly sandy loam about 3 inches thick. The subsoil is reddish brown and brown gravelly sandy loam to a depth of about 33 inches. The substratum is light reddish brown fine sandy loam about 10 inches thick over reddish brown and yellowish red gravelly sandy clay loam to a depth of 60 inches or more.

Permeability is moderately rapid, and available water capacity is moderate. Observed rooting depth is 33 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 11 inches. Surface runoff is medium to slow. The hazard of soil blowing is moderate and that of water erosion is moderate to slight, depending on slope.

This soil is used mainly for livestock grazing. The present vegetation is mesquite, perennial broomweed, Mormon-tea, burroweed, and cholla. Proper management of the vegetation is designed to increase the production of bush muhly, Arizona cottontop, and plains bristlegrass. In areas of high rainfall, the present vegetation is mesquite, fluffgrass, cane beardgrass, and some gramas. Proper management of the vegetation is designed to increase the production of black grama, cane beardgrass, and Arizona cottontop.

Grazing management that maintains the plant cover is desirable. Building fences and developing water sources are needed for distribution of grazing. Management of the brush helps overcome deteriorated range. This soil is favorable for seeding adapted species.

Controlling grazing, developing water sources, and leaving some brush in the larger drainageways for use as cover and food help in managing wildlife habitat.

This soil is in capability subclass VIe.

**39—Sonoita fine sandy loam.** This very deep and well drained soil is on alluvial terraces. Elevation ranges from 3,500 to 4,200 feet (fig. 18). This soil formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 5 percent on rangeland and 0 to 2 percent where the soil is cultivated.

Sonoita fine sandy loam makes up 85 percent of this map unit. Included with this soil in mapping are small areas of Bucklebar fine sandy loam and Tubac sandy clay loam.

Typically, the surface layer is light brown fine sandy loam about 5 inches thick. The subsoil is reddish brown sandy loam and light reddish brown gravelly sandy loam to a depth of 36 inches. The substratum is reddish brown gravelly sandy loam to a depth of 60 inches or more. Localized areas have a surface layer of sandy loam, loamy sand, or gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is moderate. Observed rooting depth on rangeland is 33 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is slow. The hazard of soil blowing is moderate and that of water erosion is slight in irrigated areas and moderate on rangeland.

About 60 percent of the acreage of this soil is used for livestock grazing. The present vegetation is mesquite, yucca, catclaw, Mormon-tea, perennial broomweed, and burroweed. Proper management of the vegetation is designed to increase the production of bush muhly, Arizona cottontop, black grama, and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Soil blowing is a hazard, and the surface of this soil is hummocky because of deposition of windblown material around the base of shrubs. Building fences, and developing water sources are needed for distribution of grazing. Management of the brush helps overcome deteriorated range. This soil is favorable for seeding adapted species.

About 40 percent of the acreage of this soil is irrigated and cropped. Grain sorghum, cotton, and alfalfa are the main crops. This soil is suited to most crops commonly grown in the survey area.

A successful rotation includes a soil-building crop. Organic matter can be added and soil blowing can be reduced by returning crop residue and using green-manure crops. Using minimum tillage and variable depths of plowing help to avoid forming a plowpan. Special attention to intervals between irrigations and amounts of water applied is important.

Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat. Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat.

This soil is in capability subclass VIe, dryland, and capability unit IIs-7, irrigated.

**40—Tres Hermanos gravelly loam.** This very deep and well drained soil is on alluvial terraces. Elevation ranges from 3,100 to 5,000 feet (fig. 19). This soil formed in old alluvium from dominantly basic igneous rock. Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope dominantly is 0 to 3 percent but ranges to 30 percent on breaks.

Tres Hermanos gravelly loam makes up 65 percent of this map unit. Included with this soil in mapping are small areas of Artesia, Cave, Dona Ana, Eba, and Arizo soils and Calciorthids and Torriorthents, eroded, on the breaks.

Typically, the surface layer is pink gravelly loam about 3 inches thick. The subsoil is reddish brown gravelly clay loam and gravelly loam to a depth of about 19 inches. The substratum is excessively limy, pink and light reddish brown gravelly loam and pink gravelly fine sandy loam to a depth of 60 inches or more (fig. 20).

Permeability is moderately slow, and available water capacity is moderate. Observed rooting depth is 19 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 6 to 8 inches. Surface runoff is medium, and the hazard of erosion is slight.

This soil is used mainly for livestock grazing. The present vegetation is creosotebush, bush muhly, and annuals. Proper management of the vegetation is designed to increase the production of bush muhly and desirable annuals.

Grazing management that maintains the plant cover is desirable. Grazing systems that include building fences and developing water sources are needed for distribution of grazing.

Controlling grazing and developing water sources help in managing wildlife habitat.

This soil is in capability subclass VIIe.

**41—Tubac sandy clay loam, 0 to 2 percent slopes.** This very deep and well drained soil is on alluvial terraces. It formed in old alluvium from mixed sources. Average annual precipitation is about 10 inches, average annual air temperature is about 65 degrees F, and average frost-free period is about 220 days. Slope is 0 to 1 percent in cultivated areas and 0 to 2 percent on native rangeland.

Tubac sandy clay loam makes up 85 percent of this map unit. Included with this soil in mapping are small areas of Bucklebar fine sandy loam, Sonoita fine sandy loam, Dona Ana fine sandy loam, and Pima silt loam.

Tubac sandy clay loam is very deep and well drained. It formed in old alluvium from acid igneous rock. Typically, the surface layer is brown sandy clay loam about 10 inches thick. The subsurface layer is light brown gravelly loam about 2 inches thick. The subsoil to a depth of 36 inches is reddish brown clay, and below this to a depth of 60 inches or more it is reddish yellow clay loam.

Permeability is slow and the available water capacity is high. Observed rooting depth is 25 inches on rangeland and potential rooting depth is 60 inches or more. The water supplying capacity is commonly 8 to 10 inches, but the water supplying capacity can be 12 to 15 inches in areas that receive runoff. Surface runoff is slow to medium. The hazards of soil blowing and water erosion are slight.

About 70 percent of the acreage of this soil is irrigated and cropped. Cotton, grain sorghum, and small grain are the main crops. This soil is suited to most crops commonly grown in the survey area.

A successful rotation includes a soil-building crop. Organic matter can be added by returning crop residue and using green-manure crops. Minimum tillage maintains tilth. Care must be used in irrigating to attain adequate penetration of water into the slowly permeable subsoil.

About 30 percent of the acreage of this soil is used for livestock grazing. The present vegetation is tobosa, mesquite, and burroweed. Proper management of the vegetation is designed to increase the production of black grama, bush muhly, sideoats grama, and plains lovegrass.

Grazing management that maintains the plant cover is desirable. Livestock prefer areas of this soil. Developing water and building fences are important in planning grazing systems. Management of the brush, pitting, and seeding help improve deteriorated range.

Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat. Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat.

This soil is in capability unit IIIs-8, irrigated, and capability subclass VIs, dryland.

**42—Tubac soils, 0 to 5 percent slopes.** This undifferentiated group is made up of nearly level to gently sloping soils on alluvial fans and terraces. Elevation ranges from 3,600 to 5,200 feet. Average annual precipitation is about 10 to 13 inches, average annual air temperature is about 63 degrees F, and average frost-free period is about 210 days. Slope is 0 to 5 percent.

Tubac gravelly loam and Tubac gravelly sandy loam are nearly equal in extent and make up 75 percent of this map unit. Included with these soils in mapping are small areas of White House, Forrest, Bucklebar, Comoro, Pima, and Grabe soils.

The Tubac soils are very deep and well drained. They formed in old alluvium from mixed sources. Typically, the surface layer is light reddish brown gravelly loam about 4 inches thick or gravelly sandy loam about 3 inches thick. The subsurface layer is light brown gravelly loam about 3 inches thick. The upper part of the subsoil is reddish brown clay to a depth of 40 inches. The lower part of the subsoil is reddish yellow clay loam to a depth of 60 inches or more.

Permeability is slow, and available water capacity is high. Observed rooting depth is 25 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 10 inches. Surface runoff is medium. The hazard of soil blowing is slight and that of water erosion is slight to moderate, depending on slope.

These soils are mainly used for livestock grazing. The present vegetation is mesquite, perennial broomweed, tobosa, and burroweed. Proper management of the vegetation is designed to increase the production of black grama, bush muhly, sideoats grama, and plains bristlegrass. In the included areas of higher rainfall the present vegetation is catclaw, tobosa, grama grasses, and cane beardgrass. Proper management of the vegetation is designed to increase the production of sideoats, black, blue, and hairy gramas; cane beardgrass; and Arizona cottontop.

Grazing management that maintains the plant cover is desirable. Livestock prefer areas of these soils. Developing water sources and building fences are important in planning grazing systems. Management of the brush, pitting, and seeding help improve deteriorated range.

Controlling grazing, developing water sources, and leaving some brush in associated swales and drainageways for use as cover help in managing wildlife habitat.

This map unit is in capability subclass VIe.

**43—Tubac-Sonoita complex.** These nearly level to gently sloping soils are on alluvial terraces and fans that extend from the Dos Cabezas Mountains. Elevation ranges from 3,500 to 4,800 feet (fig. 21). Average annual precipitation is about 10 inches, average annual air temperature is about 64 degrees F, and average frost-free period is about 220 days. Slope is 0 to 3 percent.

Tubac sandy loam makes up about 40 percent of this map unit, and Sonoita sandy loam makes up about 35 percent. These soils are intermingled with the nearly level Tubac sandy loam on terraces and fans and the gently sloping Sonoita sandy loam on ridges and interfluves. Included with these soils in mapping are 15 percent Bucklebar fine sandy loam and 10 percent small areas of Comoro, Grabe, Glendale, and Gila soils.

The Tubac sandy loam is very deep and well drained. It formed in old alluvium from dominantly acid igneous rock. Typically, the surface layer is light brown sandy loam about 6 inches thick. The subsurface layer is light brown gravelly loam about 2 inches thick. The upper part of the subsoil is reddish brown clay to a depth of 38 inches. The lower part of the subsoil is reddish yellow and reddish brown clay loam to a depth of 60 inches or more.

The Tubac soil has slow permeability, and available water capacity is high. Observed rooting depth is 25 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 7 to 10 inches. Surface runoff is medium. The hazards of soil blowing and water erosion are moderate.

The Sonoita sandy loam is very deep and well drained. It formed in old alluvium from dominantly acid igneous rock. Typically, the surface layer is light reddish brown sandy loam about 4 inches thick. The subsoil is reddish brown or brown sandy loam or gravelly sandy loam to a depth of about 34 inches. The substratum is light reddish brown fine sandy loam or gravelly sandy clay loam to a depth of 50 inches or more.

The Sonoita soil has moderately rapid permeability, and available water capacity is moderate. Observed rooting depth is 36 inches, and potential rooting depth is 50 inches or more. The water supplying capacity is 7 to 10 inches. Surface runoff is slow to medium. The hazard of soil blowing is moderate and that of water erosion is slight.

The soils in this complex are mainly used for livestock grazing. The present vegetation is similar on both soils because of the thick sandy loam surface layer. The present vegetation is mesquite, Mormon-tea, yucca, and perennial broomweed. Proper management of the vegetation is designed to increase the production of black grama, cane beardgrass, and plains bristlegrass. In the areas of higher rainfall, the present vegetation is mesquite, burroweed, and grama grasses. Proper management of the vegetation is designed to increase the production of sideoats, black, and blue gramas and cane beardgrass.

Grazing management that maintains the plant cover is desirable. Soil blowing is a hazard, and the surface is hummocky because of windblown material deposited around the base of shrubs. Building fences and developing water sources are needed for distribution of grazing. Management of the brush and seeding help overcome deteriorated range.

Controlling grazing, developing water sources on the Tubac soil, and leaving some brush along drainageways for use as cover help in managing wildlife habitat.

This complex is in capability subclass VIe.

**44—Vekol loam.** This very deep and well drained soil is on alluvial terraces. Elevation ranges from 3,500 to 4,000 feet. This soil formed in old alluvium. Average annual precipitation is about 8 inches, average annual temperature is about 62 degrees F, and average frost-free period is about 210 days. Slope is 0 to 1 percent in cultivated areas and from 0 to 2 percent on rangeland.

Vekol loam makes up 85 percent of this map unit. Included with this soil in mapping are small areas of Hondale silty clay loam, Guest silty clay loam, and Pima silt loam.

Vekol loam is very deep and well drained. It formed in old alluvium derived from a variety of rock materials. Typically, the surface layer is brown loam 10 inches thick. The subsoil is reddish brown and light reddish brown clay loam and reddish brown clay to a depth of about 47 inches. The substratum is brown gravelly sandy clay loam to a depth of 54 inches or more.

Permeability is slow, and available water capacity is high. Observed rooting depth on rangeland is 23 inches, and potential rooting depth is 54 inches or more. The water supplying capacity is 7 to 9 inches. Surface runoff is slow, and the hazard of erosion is slight.

About 70 percent of the acreage of this soil is irrigated and cropped. Cotton, grain sorghum, and alfalfa are the main crops. This soil is well suited to the crops commonly grown in the survey area.

A successful cropping system needs to include a soil-building crop. Organic matter can be added by returning a crop residue and using green-manure crops. Minimum tillage and variable depth of tillage help to maintain soil structure and avoid forming a plowpan. Care must be used in irrigating to attain adequate penetration of water into the slowly permeable subsoil.

About 30 percent of the acreage of this soil is used for livestock grazing. The present vegetation is creosotebush, mesquite, fourwing saltbush, and bush muhly. Proper management of the vegetation is designed to increase the production of bush muhly, black grama, and plains bristlegrass and, in some places, fourwing saltbush.

Grazing management that maintains plant cover is desirable. Developing water sources and building fences are important in grazing systems. Management of the brush, pitting, and seeding help improve deteriorated range.

Leaving some brush along field borders to provide cover helps in managing openland wildlife habitat. Controlling grazing, developing water sources, and leaving some brush for use as cover help in managing rangeland wildlife habitat.

This soil is in capability unit IIIs-8, irrigated, and capability subclass VIs, dryland.

**45—White House-Forrest association.** This association is made up of nearly level to gently sloping soils on alluvial fans and terraces. Elevation ranges from 4,700 to 5,300 feet (fig. 22). Average annual precipitation is about 14 inches, average annual air temperature is about 62 degrees F, and average frost-free period is about 200 days. Slope is 0 to 5 percent.

This association is about 45 percent White House gravelly loam and 30 percent Forrest sandy loam. The White House soil is high on the fans, and the Forrest soil is low on the fans and along drainageways. Included with these soils in mapping are small areas of Santo Tomas, Comoro, Pima, Grabe, and Guest soils.

The White House gravelly loam is very deep and well drained. It formed in old alluvium from dominantly igneous rock and some limestone. Typically, the surface layer is brown gravelly loam about 2 inches thick. The upper part of the subsoil is reddish brown and yellowish red clay to a depth of about 28 inches. The lower part of the subsoil is yellowish red gravelly clay to a depth of 60 inches or more.

The White House soil has slow permeability, and available water capacity is high. Observed rooting depth is 28 inches, and potential rooting depth is 60 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium. The hazards of soil blowing and water erosion are slight.

The Forrest sandy loam is very deep and well drained. It formed in old alluvium from igneous rock and limestone. Typically, the surface layer is brown sandy loam about 2 inches thick. The subsoil is reddish brown, yellowish red, and brown clay and gravelly clay to a depth of about 38 inches. The substratum is brown and light brown clay loam that has a layer of lime accumulation to a depth of 54 inches or more.

The Forrest soil has slow permeability, and available water capacity is high. Observed rooting depth is 26 inches, and potential rooting depth is 54 inches or more. The water supplying capacity is 10 to 12 inches. Surface runoff is medium to slow. The hazards of soil blowing and water erosion are slight.

The soils in this association are used mainly for livestock grazing. The present vegetation on both soils is grama grasses, tobosa, cane beardgrass, and mesquite. Proper management of the vegetation is designed to increase the production of sideoats, black, blue, and hairy gramas; cane beardgrass; Arizona cottontop; and plains bristlegrass.

Grazing management that maintains the plant cover is desirable. Developing water sources and building fences are important in grazing systems. Management of the brush, pitting, and seeding help improve deteriorated range.

Controlling grazing, developing water sources, and leaving some brush in associated swales and drainageways for use as cover help in managing wildlife habitat.

This association is in capability subclass VIe.

## Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

## Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

### Cropland planning

By Arnold Nowotny, conservation agronomist, Soil Conservation Service

Farming activities are mainly in the vicinity of Bowie and San Simon. All cropland is irrigated. Water for cropland irrigation is obtained by pumping from underground supplies. The water obtained is generally of good quality. Quantity may be short in some localities. The main crops consist of grain sorghum, small grain, and cotton and of alfalfa for hay. Recently some trial plantings of peaches, apricots, pistachio, and pecans have been made. Approximately 30,000 acres are presently cultivated.

In the following paragraphs some of the management practices used in the survey area are briefly described.

*Conservation cropping system.*—A conservation cropping system consists of cultural and management measures needed for optimum crop production. The system selected is influenced by the needs and desires of the farmer, by his ability to finance the production of a particular crop, and by government crop controls. The system is also influenced by its effect in controlling diseases, insects, and weeds and in maintaining tilth. In a small part of the survey area, erosion control must be considered in planning a conservation cropping system.

*Minimum tillage.*—Many of the soils in the survey area are unstable and pulverize easily. Minimum or limited tillage helps to lower costs of operation, to improve tilth, and to obtain better water intake. If the finer textured soils are worked when they are wet, a plowpan is likely to form. Care should also be taken to avoid pulverizing the soils then dry. Tillage should vary in depth to prevent the formation of a plowpan.

*Crop residue use.*—Many of the farms in the survey area are in continuous grain sorghum production. To maintain good crop production, the incorporation of crop residue into the soil is necessary. This improves water intake and available water capacity, increases soil aeration, improves soil structure, and increases the number of soil micro-organisms that add plant nutrients. Residue should be incorporated into the soil as soon after harvest as practical so that decay can begin as quickly as possible. Crop residue cushions the soil against the shock of tillage.

Soil micro-organisms, which decompose crop residue, require nitrogen. Low yields of following crops can be avoided by applying proper amounts of nitrogen and by incorporating crop residue at the proper time to accomplish decomposition. In some areas, crop residue management is needed to control erosion, particularly soil blowing.

*Irrigation water management.*—Management of irrigation water requires special attention. Water is supplied from deep wells. It is generally of good quality, but the quantity available is variable. Because of the small quantity in many areas, special attention should be given to the distribution system of pipelines or concrete ditches and to field leveling. Irrigation ponds and pumpbacks are commonly part of these systems.

Most of the farms are furrow or row irrigated, some fields in alfalfa are bordered and corrugated, and some areas are sprinkled. Attention should be given to the kind of crop and the soil to be irrigated. Efficient irrigation adjusts to the needs of the crop, the soil-moisture relationship at the time of irrigation, the slope of the field, the length of irrigation runs, the time it takes to apply the water, the intake rate of the soil, and other factors that may be significant at the specific time of irrigation, such as depth of furrow, organic-matter content, and weather.

### Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 8. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 8.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 8 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

### Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

*Capability classes*, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both. There are none recognized in this area.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. There are none recognized in this area.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production. There are none recognized in this area.

*Capability subclasses* are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

## Rangeland

Harvey Nessmith, range conservationist, Soil Conservation Service, assisted in preparing this section.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 9 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 9.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

*Total production* refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

*Dry weight* refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

*Characteristic species* of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Range management requires, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Almost all of the survey area is rangeland. Cow-calf operations are dominant, but operations are also cow-calf-steer in some years. The size of ranches ranges from 160 to more than 185,000 acres, and the average size is about 15,000 acres.

The native vegetation in many parts of the survey area has been partially depleted by continuous grazing, and the loss of plant cover has contributed to accelerated sheet and gully erosion. The loss of plant cover has caused an increase in surface soil temperatures and reduced the moisture effectiveness of the small amounts of natural precipitation. Other factors that cause erosion and loss of cover are roads and barriers that concentrate runoff. Much of the acreage that was once grassland is now covered with shrubs, forbs, and cacti. The amount of forage produced may be less than half of that originally produced. Productivity of the range can be increased by using management that is effective for specific kinds of soil and range sites.

In areas in which climate and topography are about the same, differences in the kind and amount of vegetation that range can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

In the northern part of the survey area, most of the soils are on mountains in materials derived from basic igneous rock and on alluvial fans in materials transported from that rock. In the southern part, most of the soils are on mountains in material derived from acid igneous rock and limestone and on alluvial fans in material transported from those rocks.

The soils are commonly gravelly and have some lime accumulation. Moderately fine to medium textured alluvial soils are along the San Simon River channel. Sandy hummocks and dunes are in some areas. In these areas, the hazard of soil blowing is high.

The major management concern on most of the rangeland is controlling grazing so vegetative cover is maintained or increased and the kinds and amounts of plants that make up the potential plant community are reestablished. Controlling or abating erosion and minimizing soil blowing are also important management concerns that help to increase the amount of vegetative cover.

The potential is good for increasing the vegetative cover and reducing erosion in the San Simon Area if sound range management, based on the soil survey information and rangeland inventories, is provided.

## Engineering

Bobby G. Kilcrease, area engineer, Soil Conservation Service, assisted in preparing this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

*Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.*

The information is presented mainly in tables. Table 10 shows, for each kind of soil, the degree and kind of limitations for building site development; table 11, for sanitary facilities; and table 13, for water management. Table 12 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

## Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 10. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

*Shallow excavations* are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

*Dwellings* and *small commercial buildings* referred to in table 10 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

*Local roads and streets* referred to in table 10 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

## Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 11 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

*Septic tank absorption fields* are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of l8 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

*Sanitary landfill* is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 11 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

*Daily cover for landfill* should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

### Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 12 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

*Roadfill* is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 16 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

*Sand* and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 16.

*Topsoil* is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

## Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

*Embankments, dikes, and levees* require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

*Aquifer-fed excavated ponds* are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 13 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

*Drainage* of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

*Irrigation* is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

## Recreation

The soils of the survey area are rated in table 14 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 14 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 11, and interpretations for dwellings without basements and for local roads and streets, given in table 10.

*Camp areas* require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

*Playgrounds* require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

*Paths and trails* for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

## Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 15, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

*Grain and seed crops* are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

*Hardwood trees* and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

*Coniferous plants* are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

*Shrubs* are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are mountain-mahogany, bitterbrush, snowberry, and big sagebrush.

*Wetland plants* are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, and cordgrass and rushes, sedges, and reeds.

*Shallow water areas* are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

*Openland habitat* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

*Woodland habitat* consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

*Wetland habitat* consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

*Rangeland habitat* consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include antelope, white-tailed deer, desert mule deer, sage grouse, meadowlark, and lark bunting.

## Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

## Engineering properties

Table 16 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 16 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

*Texture* is described in table 16 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 16. Also in table 16 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

*Liquid limit* and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

## Physical and chemical properties

Table 17 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil The estimates are based on field observations and on test data for these and similar soils.

*Moist bulk density* is the weight of soil (oven dry) per unit volume. Volume is measured when the soil is at the field moisture capacity, that is, the moisture content of 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In table 17, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter for soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by the texture, kind of clay, content of organic matter, and structure of the soil.

*Permeability* is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

*Available water capacity* is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

*Soil reaction* is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

*Salinity* is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 17. **Salinity affects the suitability of a soil for crop production**, its stability when used as a construction material, and its potential to corrode metal and concrete.

*Shrink-swell potential* depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

*Erosion factors* are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

*Wind erodibility groups* are made up of soils that have similar porperties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter of the plow layer is expressed as a percent, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth of the soil. It is a source of nitrogen and other nutrients for crops.

## Soil and water features

Table 18 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Flooding* is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

*Depth to bedrock* is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

*Cemented pans* are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan generally requires blasting.

*Risk of corrosion* pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

## Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*4*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 19, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Fluv*, meaning river or flood plain, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Torrifluvents (*Torri*, meaning hot, plus *fluvent*, the suborder of Entisols that are hot and dry).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Torrifluvents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-loamy, mixed, (calcareous), thermic Typic Torrifluvents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

## Soil series descriptions

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*3*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

### Anthony series

The Anthony series consists of very deep, well drained soils that formed in alluvium from mixed sources. Anthony soils are on alluvial fans, flood plains, and low terraces. Slope ranges from 0 to 5 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 64 degrees F.

Anthony soils are similar to Arizo, Comoro, and Gila soils and are near Arizo, Gila, and Glendale soils. Arizo soils are sandy and very gravelly. Comoro soils are dark colored. Gila soils are medium textured. Glendale soils are moderately fine textured.

Typical pedon of Anthony sandy loam in an area of Anthony-Gila complex, in Graham County 0.6 mile north of Howard Well and 1.2 miles east of the San Simon River, 2,500 feet north and 100 feet east of SW corner sec. 25, T. 11 S., R. 29 E.:

A1—0 to 4 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; common very fine interstitial and few very fine tubular pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C1—4 to 13 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common fine tubular and many very fine interstitial pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—13 to 17 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and few fine tubular pores; 30 percent fine gravel; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C3—17 to 35 inches; light yellowish brown (10YR 6/4) fine sandy loam, brown (10YR 4/3) moist; massive; soft, friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C4—35 to 60 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine interstitial and many very fine tubular pores; strongly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. Coarse fragment content ranges from 0 to 35 percent.

The A horizon is brown, pale brown, or light brown. It is dominantly sandy loam but is fine sandy loam in places. The C horizon is light yellowish brown or light brown. It ranges from gravelly sandy loam to loam.

### Arizo series

The Arizo series consists of very deep, excessively drained soils that formed in alluvium weathered mainly from igneous rock. Arizo soils are on flood plains and recent alluvial fans. Slope ranges from 0 to 5 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 64 degrees F.

Arizo soils are near Anthony, Gila, and Tres Hermanos soils. Anthony soils contain less than 35 percent coarse fragments in the control section. Gila soils have a coarse-loamy control section. Tres Hermanos soils have an argillic horizon and have a fine-loamy control section.

Typical pedon of Arizo fine sandy loam in an area of Arizo soils, in Graham County 0.2 mile north of U. S. Highway 70 along Slick Rock Wash, 2,000 feet west and

1,000 feet south of NE corner sec. 7, T. 8 S., R. 29 E.:

A1—0 to 3 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak thin and medium platy structure; very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and many very fine and fine tubular pores; moderately alkaline; clear wavy boundary.

C1—3 to 26 inches; light brown (7.5YR 6/4) very gravelly loamy sand, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; 70 percent fine gravel; moderately alkaline; clear wavy boundary.

C2—26 to 60 inches; light brown (7.5YR 6/4) very gravelly loamy sand, dark brown (7.5YR 4/4) moist; single grain appearing massive in places; loose, nonsticky and nonplastic; many very fine and fine interstitial pores; 75 percent medium gravel; slightly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. Coarse fragment content averages more than 35 percent.

The A horizon is brown, light brown, or pale brown. It is fine sandy loam, gravelly sandy loam, or gravelly loamy sand. The C horizon is brown or light brown. It is very gravelly loamy sand and very gravelly sand.

## Artesia series

The Artesia series consists of moderately deep, well drained soils that formed in alluvium weathered from mixed material, dominantly ash and tuff. Artesia soils are on alluvial fans and terraces. Slope ranges from 0 to 5 percent. Average annual precipitation is about 11 inches, and average annual air temperature is about 63 degrees F.

Artesia soils are similar to Eba soils and are near Eba and Tres Hermanos soils. Eba soils do not have silica cementation. Tres Hermanos soils do not have a silica-cemented horizon and have less than 35 percent coarse fragments in the B horizon.

Typical pedon of Artesia cobbly fine sandy loam, in Cochise County 0.6 mile north of Orange Butte Peak and 0.2 mile south of the Graham-Cochise county line, 1,000 feet south and 1,000 feet east of NW corner sec. 1, T. 12 S., R. 30 E.:

A1—0 to 3 inches; light brown (7.5YR 6/4) cobbly fine sandy loam, brown (7.5YR 4/4) moist; weak thin and medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and few very fine vesicular pores; 15 percent cobbles and 5 percent gravel; neutral; abrupt smooth boundary.

B1t—3 to 7 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, reddish brown (5YR 4/4) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and common very fine tubular pores; few thin clay films on faces of peds; 55 percent gravel; mildly alkaline; clear wavy boundary.

B21t—7 to 13 inches; reddish brown (5YR 5/4) very gravelly clay loam, reddish brown (5YR 4/4) moist; moderate very fine and fine subangular blocky structure; slightly hard and hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and tubular pores; common moderately thick clay films on faces of peds; 60 percent gravel and few cobbles; mildly alkaline; clear wavy boundary.

B22t—13 to 25 inches; reddish brown (5YR 5/4) very gravelly clay, reddish brown (5YR 4/4) moist; moderate very fine and fine subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine and fine interstitial and very fine tubular pores; common thin clay films on faces of peds; 35 percent gravel and 10 percent cobbles; very slightly effervescent; moderately alkaline; abrupt wavy boundary.

Csicam—25 to 42 inches; pink (5YR 8/3) pan strongly cemented by silica and lime, pink (5YR 7/4) moist; extremely hard; strongly effervescent; moderately alkaline.

Thickness of the solum is 20 to 39 inches. Reaction is neutral to moderately alkaline. Clay content averages more than 35 percent in the upper part of the B horizon.

The A horizon is light brown, brown, or light reddish brown. It is cobbly fine sandy loam or gravelly fine sandy loam. The B2t horizon is reddish brown, brown, or light brown. It is very gravelly sandy clay loam or very gravelly clay. The Csicam horizon is weakly to strongly cemented.

## Atascosa series

The Atascosa series consists of shallow, well drained soils that formed in residuum from acid igneous bedrock. Atascosa soils are on hills and low mountains. Slope ranges from 15 to 70 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 61 degrees F.

Atascosa soils are near Chiricahua and Graham soils. Chiricahua and Graham soils have more than 35 percent clay and less than 35 percent coarse fragments in the control section.

Typical pedon of Atascosa stony sandy loam, in an area of Atascosa-Chiricahua-Rock outcrop complex, in Cochise County 0.9 mile northwest of Mulkins Ranch; 1,000 feet east and 800 feet south of NW corner sec. 10, T. 15 S., R. 29 E.:

A1—0 to 2 inches; brown (10YR 4/3) stony sandy loam, dark brown (10YR 3/3) moist; weak thin and medium platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 40 percent fine gravel and few stones; neutral; abrupt wavy boundary.

B2t—2 to 7 inches; dark grayish brown (10YR 4/2) very gravelly sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and common fine tubular pores; few thin clay films on faces of peds and in pores; 40 percent fine gravel; mildly alkaline; abrupt irregular boundary.

Cr—7 to 10 inches; white (10YR 8/2) fractured granite bedrock with yellowish brown (10YR 5/6) clay films along fractures; extremely hard; abrupt wavy boundary.

R—10 inches; white (10YR 8/2) granite bedrock; extremely hard.

Depth to bedrock ranges from 4 to 20 inches but is commonly 8 to 12 inches. Reaction is slightly acid to mildly alkaline.

The A horizon is brown or grayish brown. It is stony sandy loam or cobbly loam. The B2t horizon is dark grayish brown or grayish brown. It is very gravelly sandy clay loam or very gravelly clay loam.

## Bluepoint series

The Bluepoint series consists of very deep, somewhat excessively drained soils that formed in alluvium and windblown material from mixed sources. Bluepoint soils are on dunes and alluvial fans. Slope generally ranges from 0 to 8 percent. Localized areas are hummocky as a result of reworking by wind and the deposition of material around the base of shrubs. Short slopes can range to as much as 15 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 65 degrees F.

Bluepoint soils are near Gothard and Hondale soils. Gothard soils have a fine-loamy control section and an argillic horizon. Hondale soils have a fine control section and an argillic horizon.

Typical pedon of Bluepoint loamy sand in an area of Bluepoint-Gothard complex, in Graham County 200 feet north of Flowing Well and 1.6 miles east of the San Simon River, 1,000 feet south and 200 feet west of NE corner sec. 36, T. 10 S., R. 28 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak thin platy structure; soft, friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

C1—2 to 15 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

C2—15 to 26 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

C3—26 to 40 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; many very fine interstitial pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C4—40 to 50 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial and few very fine tubular pores; slightly effervescent; few very fine lime filaments; moderately alkaline; clear wavy boundary.

C5—50 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; single grain appearing massive in places; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly effervescent; moderately alkaline.

Reaction is moderately alkaline or strongly alkaline. Some pedons have lime segregations below a depth of 20 inches.

The A horizon is pale brown, light brown, or brown. It is loamy sand or loamy fine sand. The C horizon is pale brown, brown, very pale brown, light reddish brown, and reddish brown. It is loamy sand or loamy fine sand.

## Bonita series

The Bonita series consists of deep, well drained soils that formed in material weathered from basalt, ash, and andesite. Bonita soils are on alluvial fans and valley plains. Slope ranges from 2 to 8 percent. Average annual precipitation is about 12 inches, and average annual air temperature is about 63 degrees F.

Bonita soils are near Cave and Hantz soils. Cave soils have a lime-cemented pan at a shallow depth. Hantz soils are light colored.

Typical pedon of Bonita cobbly silty clay, in Graham County 3.3 miles east of Whitlock Wash at Bat Tank, 2,000 feet north and 100 feet west of SE corner sec. 4, T. 9 S., R. 29 E.:

A1—0 to 3 inches; brown (10YR 5/3) cobbly silty clay, dark reddish brown (10YR 3/3) moist; weak thin and medium platy structure; hard and very hard, friable, sticky and plastic; many very fine and few fine roots; few fine interstitial and common very fine tubular pores; 20 percent cobbles; slightly effervescent; moderately alkaline, abrupt wavy boundary.

A12—3 to 11 inches; dark brown (7.5YR 4/2) clay, dark reddish brown (5YR 3/3) moist; massive parting to weak medium subangular blocky structure; hard and very hard, friable, sticky and plastic; many very fine and fine roots; common fine interstitial and few very fine tubular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C1—11 to 30 inches; reddish brown (5YR 5/3) clay, dark reddish brown (5YR 3/3) moist; massive; hard and very hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; common pressure faces; few very fine manganese concretions; slightly effervescent; moderately alkaline; gradual wavy boundary.

C2—30 to 38 inches; brown (7.5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; common pressure faces; few very fine manganese concretions; 10 percent medium and coarse gravel; slightly effervescent; moderately alkaline; abrupt wavy boundary.

IIB2tcab—38 to 55 inches; brown (7.5YR 5/4) very gravelly clay, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine interstitial and tubular pores; common moderately thick clay films on faces of peds; 75 percent fine and medium gravel; slightly effervescent; common pinkish white (5YR 8/2) medium soft lime masses; moderately alkaline.

Coarse fragments of pebble or cobble size range from few to many on the surface. When dry, these soils have cracks 0.5 to 1 inch wide and 20 to 30 inches deep. The profile many be calcareous or may not be calcareous throughout.

The A horizon is brown, dark brown, or reddish brown. It is cobbly silty clay or cobbly clay loam and clay. The C horizon is reddish brown and brown. The buried horizon is gravelly or very gravelly clay.

## Bucklebar series

The Bucklebar series consists of very deep, well drained soils that formed in alluvium weathered from mixed sources. Bucklebar soils are on alluvial fans and terraces. Slope ranges from 0 to 3 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 65 degrees F.

Bucklebar soils are similar to Dona Ana and Tres Hermanos soils and are near Dona Ana, Sonoita, and Tubac soils. Dona Ana and Tres Hermanos soils have a calcic horizon. Sonoita soils have a coarse-loamy control section. Tubac soils are in a fine family.

Typical pedon of Bucklebar fine sandy loam, in Cochise County 1.1 miles northeast of the railroad crossing in Bowie, 1,000 feet west and 1,000 feet south of NE corner sec. 3, T. 13 S., R. 28 E.:

A1—0 to 1 inch; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak thin and medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine vesicular pores; slightly acid; abrupt wavy boundary.

B1t—1 to 6 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many very fine roots; many very fine tubular pores; sand grains coated with clay; slightly acid; clear smooth boundary.

B21t—6 to 15 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; hard and very hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and common fine tubular pores; sand grains coated with clay; mildly alkaline; clear smooth boundary.

B22t—15 to 28 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine and very fine subangular blocky structure; hard and very hard, friable, sticky and plastic; few very fine roots; few very fine interstitial and many very fine tubular pores; sand grains coated with clay; moderately alkaline; abrupt smooth boundary.

B3tca—28 to 38 inches; yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; many very fine interstitial and few very fine tubular pores; sand grains coated with clay; slightly effervescent; few very fine white (5YR 8/1) soft lime masses; moderately alkaline; clear wavy boundary.

Cca—38 to 52 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many fine interstitial pores; very slightly effervescent; moderately alkaline.

Thickness of the solum ranges from 20 to 40 inches. Depth to the weak zone of carbonate accumulation is less than 40 inches.

The A horizon is brown or light brown. It is fine sandy loam or sandy loam. The B2t horizon is brown, reddish brown, and yellowish red. The C horizon is sandy loam to gravelly loamy sand.

## Cave series

The Cave series consists of shallow, well drained soils that formed in old alluvium weathered from basic igneous rock. Cave soils are on high alluvial fans. Slope dominantly is 0 to 8 percent but, in places, ranges to 20 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 64 degrees F.

Cave soils are near Anthony, Arizo, Bonita, and Tres Hermanos soils. Anthony, Arizo, and Bonita soils do not have an indurated Ccam horizon. Tres Hermanos soils have an argillic horizon and are in a fine-loamy family.

Typical pedon of Cave gravelly loam in an area of Cave-Durorthids complex, in Graham County 0.8 mile east of Hackberry Ranch, 800 feet south and 2,600 feet east of NW corner sec. 14, T. 9 S., R. 29 E.:

A11—0 to 3 inches; light brown (7.5YR 6/4) gravelly loam, dark brown (7.5YR 4/4) moist; weak thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine vesicular and few very fine tubular pores; 25 percent fine gravel and 10 percent cobbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

A12—3 to 11 inches; light brown (7.5YR 6/4) gravelly loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; 35 percent fine gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C1cam—11 to 14 inches; white (5YR 8/1) pan indurated to strongly cemented by calcium carbonate, pinkish gray (5YR 7/2) moist; thin (approximately 0.25 to 0.5 inch thick) laminar layer in the upper part of the horizon; massive; extremely hard, very firm; 80 percent lime-coated gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

C2ca—14 to 29 inches; white (5YR 8/1) very gravelly sandy loam, pinkish gray (5YR 7/2) moist; massive; very hard, very firm, slightly sticky and nonplastic; few very fine interstitial pores; 60 percent fine and medium lime-coated gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

C3ca—29 to 48 inches; white (5YR 8/1) very gravelly sandy loam, pink (5YR 7/3) moist; massive; hard and very hard, friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial and few very fine tubular pores; 50 percent fine lime-coated gravel; strongly effervescent; strongly alkaline.

Depth to the Ccam horizon ranges from 4 to 20 inches, and this horizon can be fractured or continuously indurated. From 0 to about 20 percent of the surface is covered by cobbles.

The A horizon is cobbly loam and gravelly loam.

## Chiricahua series

The Chiricahua series consists of shallow, well drained soils that formed in residuum weathered from acid igneous bedrock or quartzite. Chiricahua soils are on uplands. Slope ranges from 8 to 30 percent. Average annual precipitation is about 10 to 14 inches, and average annual air temperature is 57 to 67 degrees F.

Chiricahua soils are similar to Graham and White House and are near Atascosa, Comoro, Santo Tomas, and White House soils. Atascosa and Graham soils have a mollic epipedon. Comoro and Santo Tomas soils are deep and stratified. White House soils are deep, formed in mixed alluvium, and do not have bedrock within a depth of 40 inches.

Typical pedon of Chiricahua gravelly sandy loam in an area of Atascosa-Chiricahua-Rock outcrop complex, in Graham County 0.8 mile west of U. S. Highway 666, 1,600 feet north and 2,600 feet west of SE corner sec. 21, T. 10 S., R. 26 E.:

A1—0 to 2 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and common fine roots; common very fine interstitial and common very fine tubular pores; 30 percent fine and medium gravel; neutral; abrupt wavy boundary.

B1t—2 to 5 inches; reddish brown (5YR 5/3) gravelly clay loam, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and few fine tubular pores; few thin clay films on faces of peds; 20 percent fine gravel; neutral; abrupt wavy boundary.

B21t—5 to 12 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine and few fine roots; common very fine interstitial and few very fine tubular pores; common moderately thick clay films on faces of peds; 20 percent fine and medium gravel; mildly alkaline; clear wavy boundary.

B22t—12 to 18 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 3/4) moist; massive; very hard, firm, sticky and plastic; common very fine and few fine roots; common very fine and few fine interstitial and few very fine tubular pores; common moderately thick clay films on faces of peds; 35 percent fine and medium gravel; mildly alkaline; clear wavy boundary.

Cr—18 to 27 inches; reddish yellow (7.5YR 7/4) and white (N 8/) weathered granite and reddish brown (5YR 4/4) and reddish yellow (5YR 6/6) gravelly clay, dark reddish brown (2.5YR 3/4) and reddish brown (5YR 4/4) moist; massive; very hard, firm, sticky and plastic; few very fine interstitial pores; few thin clay films along fractures; mildly alkaline; clear wavy boundary.

R—27 inches; white (N 8/) granite bedrock, pink (5YR 7/4) moist; extremely hard.

Thickness of the solum ranges from 10 to 20 inches. Depth to consolidated bedrock ranges from 20 to 30 inches.

The A horizon is brown or reddish brown. The B2t horizon is reddish brown. It is gravelly clay loam and gravelly clay.

## Comoro series

The Comoro series consists of very deep, well drained soils that formed in alluvium from mixed sources. Comoro soils are on alluvial fans and low terraces. Slope ranges from 0 to 5 percent. Average annual precipitation is about 10 to 14 inches, and average annual air temperature is 57 to 68 degrees F.

Comoro soils are similar to Anthony, Gila, and Grabe soils and are near Glendale, Guest, Pima, and Santo Tomas soils. Anthony and Gila soils are light colored. Grabe soils are medium textured. Glendale and Pima soils are moderately fine textured. Guest soils are fine textured. Santo Tomas soils have more than 35 percent coarse fragments.

Typical pedon of Comoro fine sandy loam in an area of Comoro soils, in Cochise County 0.3 mile south of Whitetail Creek along unimproved gravel road, 3,400 feet east and 1,600 feet north of SW corner sec. 30, T. 16 S., R. 31 E.:

A11—0 to 2 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; moderately alkaline; abrupt wavy boundary.

A12—2 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine tubular pores; moderately alkaline; clear wavy boundary.

C1—10 to 19 inches; grayish brown (10YR 5/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and common fine tubular pores; 15 percent fine gravel; very slightly effervescent; moderately alkaline; clear wavy boundary.

C2—19 to 28 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine tubular pores; very slightly effervescent; moderately alkaline; abrupt wavy boundary.

C3—28 to 32 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine and common fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C4—32 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine and common fine tubular pores; slightly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. They are generally dark colored to a depth of 30 inches or more. Reaction is neutral to moderately alkaline. Coarse fragment content ranges from 0 to 35 percent.

The A horizon is brown and grayish brown. It is fine sandy loam, sandy loam, or gravelly sandy loam. The C horizon is grayish brown, brown, and pale brown. It is fine sandy loam, sandy loam, and gravelly fine sandy loam.

## Continental series

The Continental series consists of very deep, well drained soils that formed in old alluvium from acid igneous rock. Continental soils are on alluvial fans and in valleys. Slope generally ranges from 2 to 10 percent. Average annual precipitation is about 8 to 14 inches, and average annual air temperature is 57 to 68 degrees F.

Continental soils are similar to Forrest, Tubac, Vekol, and White House soils and are near Comoro, Grabe, Pima, Sonoita, and Tubac soils. Forrest soils have a calcic horizon. Tubac soils have an abrupt textural boundary. Vekol soils have weak structure or are massive in the B2t horizon. They are generally calcareous and mildly alkaline to moderately alkaline throughout. White House soils have more than 1 percent organic matter to a depth of 15 inches on a weighted average basis. Comoro, Grabe, and Pima soils have a dark colored surface horizon and do not have an argillic horizon. Sonoita soils have a moderately coarse textured control section.

Typical pedon of Continental gravelly sandy loam in an area of Continental-Tubac complex, in Graham County 400 feet west of U. S. Highway 666, 1,800 feet south and 200 feet east of NW corner sec. 15, T. 10 S., R. 26 E.:

A1—0 to 4 inches; brown (7.5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial and many very fine tubular pores; 30 percent fine and medium gravel; slightly acid; abrupt wavy boundary.

B1t—4 to 9 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine interstitial and many very fine and fine tubular pores; few thin clay films on faces of peds; 35 percent fine and medium gravel; neutral; abrupt wavy boundary.

B21t—9 to 22 inches; reddish brown (5YR 5/4) gravelly clay, reddish brown (5YR 4/4) moist; strong medium prismatic structure parting to strong angular blocky; hard and very hard, very firm, very sticky and very plastic; common very fine and fine roots; common very fine interstitial and common very fine and fine tubular pores; common moderately thick clay films on faces of peds; 15 percent gravel; moderately alkaline; abrupt wavy boundary.

B22t—22 to 35 inches; reddish brown (5YR 5/4) and yellowish red (5YR 5/6) gravelly sandy clay, reddish brown (5YR 5/4) and yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; few very fine tubular pores; few thin clay films on faces of peds; 35 percent fine and medium gravel; slightly effervescent; few fine pinkish white (5YR 8/2) soft lime masses, pink (5YR 8/3) moist; moderately alkaline; clear wavy boundary.

B3t—35 to 46 inches; reddish brown (5YR 5/4) and yellowish red (5YR 5/6) gravelly sandy clay loam, reddish brown (5YR 4/4) and yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; few very fine interstitial and few very fine tubular pores; sand grains coated with clay; 25 percent fine gravel; slightly effervescent; few fine pink (5YR 8/2) soft lime masses, pinkish gray (5YR 7/2) moist; moderately alkaline; clear wavy boundary.

C—46 to 60 inches; reddish yellow (7.5YR 6/6) gravelly fine sandy loam, strong brown (7.5YR 5/6) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and few very fine tubular pores; 25 percent fine gravel; moderately alkaline; clear wavy boundary.

Thickness of the solum is 30 to 60 inches or more. Some pedons have a calcic horizon below a depth of 30 inches. Coarse fragment content ranges from 5 to 35 percent.

The A horizon is brown, light brown, or reddish brown. It is gravelly sandy loam or sandy loam. The B2t horizon is reddish brown or light reddish brown. It is gravelly clay or gravelly sandy clay or clay. The C horizon is dominantly gravelly sandy clay loam or gravelly fine sandy loam but ranges from clay loam to gravelly loamy sand.

## Dona Ana series

The Dona Ana series consists of very deep, well drained soils that formed in alluvium from mixed sources. Dona Ana soils are on alluvial fans and terraces. Slope is dominantly 0 to 2 percent but, in places, ranges to 5 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 64 degrees F.

Dona Ana soils are similar to Tres Hermanos soils and are near Bucklebar and Sonoita soils. Tres Hermanos soils have less than 45 percent sand and more than 15 percent coarse fragments in the Bt horizon. Bucklebar and Sonoita soils do not have a calcic horizon within a depth of 40 inches.

Typical pedon of Dona Ana fine sandy loam, 0 to 5 percent slopes, in Graham County 200 feet north of Graham-Cochise county line road, 800 feet west and 200 feet north of SE corner sec. 35, T. 11 S., R. 28 E.:

A1—0 to 3 inches; light brown (7.5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium and thick platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; common very fine interstitial and many very fine vesicular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

B21tca—3 to 12 inches; brown (7.5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard and hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine interstitial and common very fine tubular pores; few thin clay films on faces of peds; violently effervescent; moderately alkaline; clear wavy boundary.

B22tca—12 to 25 inches; brown (7.5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; violently effervescent; few white (5YR 8/1) soft lime masses; moderately alkaline; abrupt wavy boundary.

C1ca—25 to 37 inches; pinkish white (7.5YR 8/1) and light brown (7.5YR 6/4) loam, pinkish gray (5YR 7/2) and brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and plastic; many very fine roots;

many very fine tubular pores; violently effervescent; 20 percent hard lime nodules; moderately alkaline; abrupt wavy boundary.

C2ca—37 to 60 inches; light brown (7.5YR 6/4) and pinkish gray (7.5YR 7/2) loam, dark brown (7.5YR 4/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline.

Thickness of the solum is 16 to 30 inches. Depth to the calcic horizon is 12 to 30 inches.

The A horizon is light brown or brown. It is fine sandy loam or sandy loam.

## Eba series

The Eba series consists of very deep, well drained soils that formed in old alluvium from mixed sources. Eba soils are on alluvial fans and terraces. Slope is dominantly 0 to 8 percent but, in places, ranges to 15 percent. Average annual precipitation is about 8 to 14 inches, and average annual air temperature is 57 to 68 degrees F.

Eba soils are similar to Artesia soils and are near Comoro, Santo Tomas, Tres Hermanos, and Tubac soils. Artesia soils have a silica-cemented pan at a depth of less than 40 inches. Comoro and Santo Tomas soils are stratified alluvial soils. Tres Hermanos and Tubac soils have less than 35 percent coarse fragments, and Tres Hermanos soils have a loamy control section.

Typical pedon of Eba gravelly fine sandy loam, in Cochise County 200 feet north of the Wood Canyon road and 8.4 miles south of San Simon, 200 feet west and 200 feet south of NE corner sec. 3, T. 15 S., T. 30 E.:

A1—0 to 3 inches; brown (7.5YR 5/4) gravelly fine sandy loam, dark reddish brown (5YR 3/4) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many fine vesicular and few very fine tubular pores; 30 percent fine gravel; slightly acid; abrupt wavy boundary.

B1t—3 to 15 inches; reddish brown (5YR 4/4) very gravelly sandy clay loam, dark reddish brown (5YR 3/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine tubular pores; clay films coat sand grains; 50 percent fine and medium gravel; mildly alkaline; abrupt wavy boundary.

B21t—15 to 25 inches; yellowish red (5YR 5/6) very gravelly clay, yellowish red (5YR 4/6) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; few very fine tubular pores; 60 percent fine and medium gravel; many thin clay films on faces of peds; mildly alkaline; abrupt wavy boundary.

B22tca—25 to 33 inches; yellowish red (2.5YR 5/6) very gravelly clay, yellowish red (2.5YR 4/6) moist; moderate fine and medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; common fine tubular pores; 40 percent fine and medium gravel; many moderately thick clay films on faces of peds; slightly effervescent; few very fine pinkish white (5YR 8/2) lime filaments, pinkish gray (5YR 7/2) moist; moderately alkaline; abrupt wavy boundary.

Cca—33 to 56 inches; pinkish white (5YR 8/2) and reddish yellow (5YR 6/6) weakly cemented very gravelly loam, pinkish gray (5YR 6/2) and yellowish red (5YR 5/6) moist; massive; slightly hard and hard, friable, slightly sticky and nonplastic; few fine roots; many very fine tubular pores; 50 percent fine and medium lime-coated gravel; violently effervescent; moderately alkaline.

Thickness of the solum is 24 to 45 inches. The C horizon is calcareous and may be weakly cemented. Some pedons are calcareous throughout.

The A horiozn is brown or light brown. It is gravelly fine sandy loam or gravelly sandy loam. The B2t horizon is reddish brown and yellowish red. It is very gravelly sandy clay loam and very gravelly clay.

## Faraway series

The Faraway series consists of shallow, well drained soils that formed in residuum from igneous bedrock. Faraway soils are on hills and mountains. Slope is dominantly 30 to 60 percent but, in places, ranges from 15 to 75 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 52 degrees F.

Faraway soils are near Mokiak soils. Mokiak soils have an argillic horizon and are moderately deep over bedrock.

Typical pedon of Faraway very cobbly loam in an area of Faraway-Rock outcrop complex, in Cochise County 0.9 mile northeast of Dos Cabezas peaks, 1,300 feet east and 1,300 feet north of SW corner sec. 9, T. 14 S., R. 27 E.:

A1—0 to 10 inches; grayish brown (10YR 5/2) very cobbly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, friable, slightly sticky and plastic; many very fine and common fine roots; many very fine interstitial and tubular pores; 35 percent gravel and 20 percent cobbles; neutral; abrupt wavy boundary.

Cr—10 to 18 inches; light gray (10YR 7/1) fractured rhyolite bedrock, light brownish gray (10YR 6/2) moist; extremely hard.

R—18 inches; light gray (10YR 7/1) rhyolite bedrock, light brownish gray (10YR 6/2) moist; extremely hard.

Coarse fragments consist of gravel, cobbles, or stones in varying amounts. Depth to bedrock ranges from 4 to 20 inches.

The A horizon is grayish brown or dark grayish brown and is dominantly very cobbly loam but ranges to very gravelly loam.

## Forrest series

The Forrest series consists of very deep, well drained soils that formed in alluvium weathered from igneous and sedimentary bedrock. Forrest soils are on valley plains and alluvial fans. Slope ranges from 0 to 5 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 62 degrees F.

Forrest soils are similar to Continental, Eba, Tubac, and White House soils and are near Comoro, Guest, Kimbrough, Pima, Tubac, and White House soils. Continental soils have less than 1 percent organic matter to a depth of 15 inches and have a gravelly clay loam and gravelly clay control section. Eba soils have more than 35 percent coarse fragments in the control section. White House soils do not have a calcic horizon. Tubac soils have an abrupt increase of clay at the upper boundary of the argillic horizon. Comoro, Guest, and Pima soils do not have an argillic horizon. Kimbrough soils have a lime-cemented pan at a shallow depth and do not have an argillic horizon.

Typical pedon of Forrest sandy loam in an area of White House-Forrest association, in Cochise County 0.2 mile south of State Highway 186, 900 feet west of SE corner sec. 25, T. 15 S., R. 27 E.:

A1—0 to 2 inches; brown (7.5YR 5/4) sandy loam, dark reddish brown (5YR 3/4) moist; weak thin platy structure; soft, very friable, slightly sticky and nonplastic; many very fine roots; many very fine interstitial and few very fine tubular pores; neutral; abrupt smooth boundary.

B1t—2 to 4 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak very fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; neutral; abrupt wavy boundary.

B21t—4 to 11 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine and few fine roots; many very fine tubular pores; common moderately thick clay films on faces of peds; moderately alkaline; abrupt wavy boundary.

B22t—11 to 19 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 3/4) moist; weak medium prismatic structure parting to weak very fine subangular blocky; very hard, friable, sticky and plastic; many very fine and few fine roots; many very fine tubular pores; common moderately thick clay films on faces of peds; 15 percent fine gravel; moderately alkaline; abrupt wavy boundary.

B23t—19 to 26 inches; yellowish red (5YR 4/6) clay, dark red (2.5YR 3/6) moist; weak fine prismatic structure parting to strong fine and very fine subangular blocky; very hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; common moderately thick clay films on faces of peds; 10 percent fine gravel; moderately alkaline; abrupt wavy boundary.

B3tca—26 to 38 inches; brown (7.5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; many very fine and few fine tubular pores; 10 percent fine gravel; violently effervescent; common medium white (N 8/) soft lime masses, pink (7.5YR 7/3) moist; moderately alkaline; clear wavy boundary.

C1ca—38 to 47 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; 5 percent fine gravel; violently effervescent; common medium pink (7.5YR 8/2) soft lime masses, pink (7.5YR 7/4) moist; moderately alkaline; clear wavy boundary.

C2ca—47 to 54 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 4/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; 10 percent fine gravel; violently effervescent; strongly alkaline.

Thickness of the solum ranges from 24 to 38 inches. Depth to the calcic horizon ranges from 24 to 36 inches.

The A horizon is brown or reddish brown. It is sandy loam, gravelly sandy loam, or gravelly loam. The B2t horizon is reddish brown, yellowish red, and brown. It is dominantly clay but in places is gravelly clay to clay loam.

## Gila series

The Gila series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Gila soils are on flood plains and low terraces. Slope ranges from 0 to 3 percent. Average annual precipitation is about 9 inches, and average annual air temperature is 65 degrees F.

Gila soils are similar to Anthony and Glendale soils and are near Dona Ana, Tres Hermanos, Hondale, Anthony, and Glendale soils. Anthony soils are moderately coarse textured. Glendale soils are moderately fine textured. Dona Ana and Tres Hermanos soils have a moderately fine textured argillic horizon. Hondale soils have a fine-textured natric horizon.

Typical pedon of Gila loam, in Graham County 0.1 mile north of Graham-Cochise county line road, 200 feet east and 400 feet north of SW corner sec. 36, T. 11 S., R. 29 E.:

A1—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium platy structure; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—4 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and common fine roots; common very fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—18 to 60 inches; pale brown (10YR 6/3) loam with thin strata of fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and common fine roots; few very fine interstitial and common very fine tubular pores; stratified layers with worm casts; strongly effervescent; moderately alkaline.

These soils are stratified, and thickness and texture of the strata are variable. In some areas, reaction is strongly alkaline.

The A horizon is pale brown or brown. It is loam, very fine sandy loam, or fine sandy loam. The C horizon is silt loam to very fine sandy loam.

## Glendale series

The Glendale series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Glendale soils are on flood plains and low terraces. Slope ranges from 0 to 1 percent. Average annual precipitation is about 9 inches, and average annual air temperature is about 65 degrees F.

Glendale soils are similar to Gila, Grabe, and Pima soils and are near Anthony and Gila soils. Gila soils have less than 18 percent clay in the control section. Grabe and Pima soils have value darker than 3.5 moist and 5.5 dry and chroma less than 2.5 moist. Anthony soils are moderately coarse textured.

Typical pedon of Glendale silty clay loam in an area of Glendale-Gila association, frequently flooded, in Graham County 2 miles east of the San Simon River, 2,600 feet west of NE corner sec. 30, T. 8 S., R. 28 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak thin and medium platy structure; slightly hard, very friable, sticky and plastic; common very fine and many fine roots; many very fine interstitial and few very fine vesicular pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C1—2 to 18 inches; pale brown (10YR 6/3) silty clay loam with thin strata of silt loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and common fine roots; many very fine and common fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—18 to 33 inches; very pale brown (10YR 7/3) light silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and plastic; many very fine and few fine roots; many very fine and common fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—33 to 43 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; common very fine and few fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C4—43 to 60 inches; very pale brown (10YR 7/3) heavy silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, sticky and plastic; common very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. In some areas, reaction is strongly alkaline.

The A horizon is pale brown or brown. It is dominantly silty clay loam. The C horizon is pale brown and very pale brown. It is silty clay loam and silt loam.

## Gothard series

The Gothard series consists of very deep, moderately well drained soils that formed in old lake deposits and alluvium from mixed sources. Slope is dominantly 0 to 1 percent but, in places, ranges to 2 percent. Average annual precipitation is about 9 inches, and average annual air temperature is 65 degrees F.

Gothard soils are similar to Hondale soils and are near Bluepoint, Glendale, and Hondale soils. Bluepoint soils have a sandy control section and do not have an argillic horizon. Glendale soils do not have an argillic horizon. Hondale soils have a fine control section.

Typical pedon of Gothard fine sandy loam in an area of Bluepoint-Gothard complex, in Graham County about 13 miles northeast of Bowie, 50 feet south and 50 feet east of NW corner sec. 25, T. 11 S., R. 29 E.:

A2—0 to 2 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; few fine interstitial and many fine tubular pores; very slightly effervescent; moderately alkaline; abrupt wavy boundary.

B21tsa—2 to 10 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; many very fine and common fine roots; few fine interstitial and many fine tubular pores; common thin clay films on faces of peds; slightly effervescent; few fine pinkish white (7.5YR 8/2) soft lime masses; very strongly alkaline; clear wavy boundary.

—B22tcasa—10 to 22 inches; very pale brown (10YR 7/3) sandy clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; few very fine interstitial and many very fine tubular pores; few thin clay films on faces of peds; strongly affervescent; common fine white (10YR 8/2) soft lime masses, light gray (10YR 7/2) moist; very strongly alkaline; abrupt wavy boundary.

C1casa—22 to 35 inches; light brownish gray (2.5YR 6/2) sandy loam, grayish brown (2.5YR 5/2) moist; massive; soft, friable, slightly sticky and nonplastic; few very fine roots; few very fine interstitial and many very fine tubular pores; strongly effervescent; very strongly alkaline; clear smooth boundary.

C2casa—35 to 47 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial and many very fine tubular pores; strongly effervescent; very strongly alkaline; clear wavy boundary.

IIC3—47 to 60 inches; light brownish gray (2.5Y 6/2) loamy sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial and few very fine tubular pores; slightly effervescent; very strongly alkaline.

Thickness of the solum ranges from 20 to more than 40 inches. The soil is saline. Reaction is moderately alkaline to very strongly alkaline.

The A horizon is very pale brown, light brownish gray, or pale brown. It is fine sandy loam or loam. The B2t horizon is light brown or very pale brown. It is sandy clay loam or clay loam. The C horizon is clay loam to loamy sand.

## Grabe series

The Grabe series consists of very deep, well drained soils that formed in recent alluvium from mixed sources. Grabe soils are on low terraces and fans. Slope ranges from 0 to 3 percent. Average annual precipitation is about 11 inches, and average annual air temperature is about 64 degrees F.

Grabe soils are similar to Gila and Comoro soils and are near Pima, Comoro, Dona Ana, and Eba soils. Gila soils have less than 1 percent organic matter in the upper horizons. Comoro soils have a sandy loam control section. Pima soils are fine-loamy. Dona Ana soils have a fine-loamy B2t horizon. Eba soils have a fine-textured B2t horizon and have more than 35 percent coarse fragments in the control section.

Typical pedon of Grabe silt loam in an area of Pima-Grabe association, in Cochise County about 3.5 miles south of Bowie, 1,000 feet east and 500 feet north of SW corner sec. 27, T. 13 S., R. 28 E.:

A11—0 to 5 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak thin and medium platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial and tubular pores; moderately alkaline; abrupt wavy boundary.

A12—5 to 12 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; mildly alkaline; abrupt wavy boundary.

A13—12 to 24 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine and fine tubular pores; very slightly effervescent; moderately alkaline; clear smooth boundary.

C1—24 to 39 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; massive; soft, very friable, slightly sticky and nonplastic; many very fine roots; many very fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—39 to 60 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; common very fine tubular pores; 10 percent fine gravel; slightly effervescent; moderately alkaline.

These soils are stratified with finer and coarser textured materials. The dark colored horizons are 20 to more than 60 inches thick. Coarse fragment content ranges to 35 percent. Reaction is mildly alkaline to moderately alkaline. Clay content in the control section averages less than 18 percent.

The A horizon is dark grayish brown and brown. It is silt loam or gravelly loam. The C horizon is pale brown, brown, or yellowish brown. It is loam or gravelly loam and ranges to gravelly loamy sand in the lower part.

## Graham series

The Graham series consists of shallow, well drained soils that formed in residuum weathered from basalt. Graham soils are on hills and mountains. Slope is dominantly 15 to 30 percent but, in places, ranges to 60 percent. Average annual precipitation is about 13 inches, and average annual air temperature is 61 degrees F.

Graham soils are similar to Atascosa soils and are near Cave, Eba, and Atascosa soils. Cave soils have a lime-cemented pan at a shallow depth. Eba and Atascosa soils have more than 35 percent coarse fragments in the control section, and Eba soils are very deep.

Typical pedon of Graham cobbly clay loam in an area of Graham-Rock outcrop complex, in Graham County 1 mile west of Whitlock Wash, 3,200 feet west and 600 feet south of NE corner sec. 34, T. 8 S., R. 29 E.:

A1—0 to 2 inches; brown (7.5YR 5/2) cobbly clay loam, dark reddish brown (5YR 3/3) moist; weak thin platy and moderate fine granular structure; slightly hard, friable, sticky and plastic; common very fine roots; many very fine interstitial pores; 25 percent fine and medium gravel and 20 percent cobbles; mildly alkaline; abrupt wavy boundary.

B21t—2 to 7 inches; reddish brown (5YR 4/3) gravelly clay, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common very fine interstitial and tubular pores; few thin clay films on faces of peds; 20 percent fine, medium, and coarse gravel; moderately alkaline; clear wavy boundary.

B22t—7 to 13 inches; reddish brown (5YR 4/3) gravelly clay, dark reddish brown (5YR 3/3) moist; strong fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common very fine interstitial and tubular pores; few thin clay films on faces of peds; 30 percent fine, medium, and coarse gravel; moderately alkaline; abrupt irregular boundary.

Cr—13 to 17 inches; fractured basalt bedrock with pinkish white (5YR 8/2) lime coating, pink (5YR 7/3) moist; violently effervescent on surface of rock.

R—17 inches; basalt bedrock; slightly effervescent on fractured faces.

Thickness of the solum and depth to bedrock range from 8 to 20 inches. Coarse fragment content is less than 35 percent.

The A horizon is brown and reddish brown. Fractured rock and lime segregation are common above the hard bedrock.

## Guest series

The Guest series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Guest soils are on flood plains, alluvial fans, and low terraces. Slope is 0 to 1 percent but, in places, ranges to 2 percent. Average annual precipitation is about 8 to 12 inches, and average annual air temperature is 63 to 64 degrees F.

Guest soils are similar to Hantz, Tubac, White House, Vekol, and Pima soils. Hantz soils have value lighter than 3.5, moist, and 5.5, dry, and chroma less than 3.5, moist. Pima soils have a fine-silty control section. Hondale soils have a fine textured natric horizon. Tubac, White House, and Vekol soils have a fine-textured argillic horizon.

Typical pedon of Guest silty clay in an area of Guest and Hantz soils, in Cochise County northeast of State Highway 186, 1,000 feet east and 1,000 feet south of NW corner sec. 15, T. 16 S., R. 28 E.:

A11—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay; very dark grayish brown (10YR 3/2) moist; weak thin and medium platy structure near the surface and weak fine granular structure below; hard, friable, sticky and plastic; many very fine and few fine roots; few very fine interstitial and many very fine tubular pores; moderately alkaline; clear wavy boundary.

A12—7 to 17 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; many very fine and few fine roots; many very fine interstitial and few very fine tubular pores; moderately alkaline; clear wavy boundary.

C1—17 to 32 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, sticky and plastic; common very fine roots; few very fine interstitial and common very fine tubular pores; very slightly effervescent; moderately alkaline; clear wavy boundary.

C2—32 to 40 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, sticky and plastic; common very fine roots; common very fine interstitial and few very fine tubular pores; slightly effervescent; few very fine white (10YR 8/1) lime filaments; moderately alkaline; clear wavy boundary.

C3—40 to 60 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine interstitial pores; slightly effervescent; moderately alkaline.

These soils are stratified with coarser textured materials. Reaction is moderately alkaline or strongly alkaline.

In some areas, gypsum crystals are in the lower part of the C horizon.

The A horizon is dark grayish brown or brown. It is silty clay, clay, or silty clay loam. The C horizon is dark grayish brown and brown or reddish brown. It is clay, silty clay, and clay loam.

## Hantz series

The Hantz series consists of very deep, well drained soils that formed in alluvium from mixed sources. Hantz soils are on alluvial fans, flood plains, and low terraces. Slope ranges from 0 to 2 percent. Average annual precipitation is about 10 to 13 inches, and average annual air temperature is about 63 degrees F.

Hantz soils are similar to Gila, Glendale, and Guest soils and are near Glendale, Bonita, and Tres Hermanos soils. Gila soils are in the coarse-loamy family, and Glendale soils are in the fine-silty family. Bonita soils are montmorillonitic. Tres Hermanos soils have an argillic horizon. Guest soils have darker colors in the profile.

Typical pedon of Hantz silt loam in an area of Guest and Hantz soils, in Graham County about 4 miles south of Hackberry ranch headquarters, 800 feet west and 1,800 feet south of NE corner sec. 1, T. 10 S., R. 29 E.:

A11—0 to 4 inches; light brown (7.5YR 6/4) silt loam, reddish brown (7.5YR 5/4) moist; weak thin and medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial and common fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A12—4 to 7 inches; light brown (7.5YR 6/4) silty clay loam, reddish brown (7.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and plastic; common very fine and few fine roots; common very fine interstitial and common fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—7 to 35 inches; light reddish brown (5YR 6/3) silty clay, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure appearing massive in places; very hard, firm, sticky and plastic; common very fine and fine roots; many fine interstitial and common very fine tubular pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

B2tcab—35 to 41 inches; reddish brown (5YR 5/4) clay, yellowish red (5YR 4/6) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; many very fine tubular and common very fine interstitial pores; common thin clay films on faces of peds; violently effervescent; common fine pinkish white (5YR 8/2) soft lime masses, light reddish brown (5YR 6/4) moist; moderately alkaline; clear wavy boundary.

IIC2cab—41 to 60 inches; pinkish gray (7.5YR 7/2) gravelly silt loam, light brown (7.5YR 6/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few fine roots; few very fine tubular and interstitial pores; 30 percent fine gravel; violently effervescent; moderately alkaline.

These soils are stratified with coarser textured materials. In some places, a buried horizon is not present.

The A horizon is light brown or pale brown. It is silt loam, silty clay loam, or silty clay. The C1 horizon is light reddish brown silty clay or clay. The buried horizon, if present, is reddish brown clay to gravelly silt loam.

## Hondale series

The Hondale series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Hondale soils are on alluvial fans and terraces. Slope ranges from 0 to 3 percent. Average annual precipitation is about 8 to 10 inches, and average annual air temperature is 64 degrees F.

Hondale soils are similar to Gothard soils and are near Glendale, Guest, Pima, and Vekol soils. Gothard soils have a fine-loamy control section. Guest and Vekol soils do not have a natric horizon. Glendale and Pima soils do not have an argillic horizon.

Typical pedon of Hondale silty clay loam, in Cochise County 1.5 miles north of Interstate-10, 2,200 feet north and 1,600 feet east of SW corner sec. 15, T. 13 S., R. 30 E.:

A11—0 to 3 inches; pale brown (10YR 6/3) silty clay loam, brown (7.5YR 4/4) moist; weak thin platy structure; soft, friable, sticky and slightly plastic; many very fine and fine roots; many very fine interstitial and common very fine tubular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

A12—3 to 12 inches; brown (7.5YR 5/2) silt loam, brown (10YR 4/3) moist; massive; soft, friable, sticky and plastic; many very fine and fine roots; many very fine interstitial and common very fine tubular pores; strongly effervescent; very strongly alkaline; abrupt smooth boundary.

B1tca—12 to 15 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium angular blocky; slightly hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; violently effervescent; common fine pinkish white (7.5YR 8/2) soft lime masses, pinkish gray (7.5YR 7/2) moist; very strongly alkaline; abrupt smooth boundary.

B2tca—15 to 26 inches; light brown (7.5YR 6/4) silty clay, brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to moderate fine and very fine angular blocky; very hard and hard, firm, sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; strongly effervescent; very strongly alkaline; clear wavy boundary.

B3tca—26 to 35 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; common very fine and fine tubular pores; few thin clay films on faces of peds; strongly effervescent; few fine pinkish white (7.5YR 8/2) soft lime masses, pinkish gray (7.5YR 7/2) moist; strongly alkaline; abrupt wavy boundary.

Ccacs—35 to 60 inches; pinkish gray (7.5YR 7/2) silty clay loam, pinkish gray (7.5YR 6/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; many very fine interstitial and common fine tubular pores; violently effervescent; common fine pinkish white (7.5YR 8/2) soft lime masses; few fine gypsum crystals; moderately alkaline.

Thickness of the solum is 20 to 40 inches. These soils are saline in some areas. Reaction is moderately alkaline to very strongly alkaline.

The A horizon is pale brown and brown. It is loam, silt loam, fine sandy loam, or silty clay loam. The B2t horizon is light brown and brown. It is silty clay loam and silty clay. The C horizon has 50 to 70 percent lime and commonly has a few gypsum crystals.

## Kimbrough series

The Kimbrough series consists of shallow, well drained soils that formed in alluvium derived mainly from limestone. Kimbrough soils are on high alluvial fans. Slope ranges from 0 to 5 percent. Average annual precipitation is about 12 inches, and average annual air temperature is 62 degrees F.

Kimbrough soils are similar to Cave soils and are near Mabray, Santo Tomas, and Tres Hermanos soils. Cave soils contain less than 1 percent organic matter and are light colored. Mabray soils are shallow to rock. Santo Tomas soils do not have an indurated pan and have more than 35 percent coarse fragments. Tres Hermanos soils have an argillic horizon and do not have an indurated pan.

Typical pedon of Kimbrough gravelly fine sandy loam, in Cochise County 0.1 mile south of Turkey Creek; 2,000 feet west of the SE corner sec. 33, T. 16 S., R. 31 E.:

A11—0 to 3 inches; brown (7.5YR 5/2) gravelly fine sandy loam, dark brown (7.5YR 3/2) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; 30 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

A12—3 to 14 inches; brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 25 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

Ccam—14 to 16 inches; white (5YR 8/1) indurated pan with 1/4- to 1/2-inch laminar cap, pinkish gray (5YR 7/2) moist; massive; extremely hard, extremely firm, nonsticky and nonplastic; 25 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

Depth to the indurated pan ranges from 4 to 20 inches, and the pan may be fractured or continuous.

The A horizon is brown or dark grayish brown. It is gravelly fine sandy loam and gravelly loam.

## Mabray series

The Mabray series consists of shallow, well drained soils that formed in residuum from limestone and marble. Mabray soils are on gently rolling ridges to very steep hills. Slope ranges from 15 to 45 percent. Average annual precipitation is 14 inches, and average annual air temperature is 62 degrees F.

Mabray soils are similar to Kimbrough soils and are near Kimbrough, Atascosa, and Chiricahua soils. Kimbrough soils have a lime-cemented pan and contain less than 35 percent coarse fragments. Atascosa and Chiricahua soils have an argillic horizon.

Typical pedon of Mabray very gravelly loam in an area of Mabray-Rock outcrop complex, in Cochise County south of Cochise mine in the Davis Mountains; 2,100 feet north and 550 feet east of the SW corner sec. 4, T. 17 S., R. 31 E.:

A11—0 to 1 inch; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; 50 percent angular gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

A12—1 to 12 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many fine tubular and few fine interstitial pores; violently effervescent; moderately alkaline; abrupt irregular boundary.

Cr—12 to 15 inches; black (N 2.5/0) fractured limestone with white (10YR 8/1) lime coatings, light gray (10YR 7/2) moist; violently effervescent.

R—15 inches; black limestone; violently effervescent.

Depth to bedrock ranges from 4 to 20 inches. Coarse fragments make up 35 to 85 percent of the control section. Reaction is moderately alkaline.

The A horizon is brown and grayish brown. It is very gravelly loam or very cobbly loam.

## Mokiak series

The Mokiak series consists of moderately deep, well drained soils that formed in residuum from granite and related rocks. Mokiak soils are on mountains. Slope is dominantly 30 to 45 percent but, in places, ranges from 30 to 60 percent. Average annual precipitation is about 16 inches, and average annual air temperature is about 54 degrees F.

Mokiak soils are near Faraway soils. Faraway soils do not have an argillic horizon and are shallow to bedrock.

Typical pedon of Mokiak cobbly sandy clay loam in an area of Mokiak-Faraway-Rock outcrop complex, in Cochise County about 2 miles north of the town of Dos Cabezas; 2,500 feet east and 200 feet north of SW corner sec. 21, T. 14 S., R. 27 E.:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) cobbly sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine and very fine tubular pores; 30 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.

B2t—4 to 12 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine and very fine tubular and interstitial pores; common thin clay films in pores and very few thin clay films on faces of peds; 40 percent angular gravel; neutral; clear smooth boundary.

B3t—12 to 26 inches; brown (7.5YR 5/4) and brown (10YR 5/3) very gravelly sandy clay loam which has a mottled appearance, brown (7.5YR 4/4) and dark brown (10YR 3/3) moist; massive (grus); hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine tubular and interstitial pores; few thin clay films on faces of rock fractures; 40 percent angular gravel; moderately alkaline; clear smooth boundary.

Cr—26 to 30 inches; yellowish brown (10YR 5/6) and light gray (10YR 7/2) highly weathered granite (grus); extremely hard, firm, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; common thin yellowish red (5YR 4/6) clay films on faces of fractures; common reddish yellow (7.5YR 6/8) iron mottles; 60 percent angular gravel; moderately alkaline; clear wavy boundary.

R—30 inches; yellowish brown (10YR 5/6) and light gray (10YR 7/2) granite bedrock; extremely hard.

Thickness of the solum ranges from 26 to 33 inches. Depth to bedrock is 30 to 40 inches. The mollic epipedon is 10 to 19 inches thick. Reaction is neutral to moderately alkaline. Coarse fragments on the surface consist of gravel, cobbles, and stones in varying amounts.

The A horizon is dark grayish brown or brown. It is cobbly, gravelly, or stony sandy clay loam. The B2t horizon is brown or yellowish brown. It is very gravelly sandy clay loam.

## Pima series

The Pima series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Pima soils are on flood plains and low terraces. Slope is dominantly 0 to 1 percent but, in places, ranges to 2 percent. Average annual precipitation is 12 inches, and average annual air temperature is 64 degrees F.

Pima soils are similar to Glendale and Grabe soils and are near Bucklebar, Tubac, and Grabe soils. Glendale soils have less than 1 percent organic matter in the surface horizon and are light colored. Grabe soils have a coarse-loamy control section. Bucklebar and Tubac soils have an argillic horizon.

Typical pedon of Pima silt loam in an area of Pima-Grabe silt loams, in Cochise County 1.1 miles east of Apache Pass Road, 3,000 feet east and 200 feet north of SW corner sec. 8. T. 14 S., R. 29 E.:

A11—0 to 3 inches; brown (10YR 5/3) silt loam, dark brown (7.5YR 3/3) moist; weak thin platy structure; slightly hard, very friable, slightly sticky and plastic; many very fine roots; many very fine interstitial and few very fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A12—3 to 15 inches; brown (10YR 4/3) silt loam, dark brown (7.5YR 3/2) moist; massive; slightly hard, friable, slightly sticky and plastic; many very fine roots; many very fine interstitial and tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A13—15 to 31 inches; brown (10YR 4/3) silt loam, dark brown (7.5YR 3/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; many very fine tubular and few fine interstitial pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C—31 to 60 inches; brown (10YR 4/3) silty clay loam, dark brown (7.5YR 3/3) moist; massive; hard and slightly hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline.

These soils are stratified with coarser textured materials. The dark colored surface layer ranges from 20 to 36 inches or more in thickness. Some pedons are noncalcareous in the upper 30 inches.

The A horizon is brown or grayish brown. It is silt loam or silty clay loam.

## Pridham series

The Pridham series consists of very deep, somewhat poorly drained soils that formed in old alluvium from mixed sources. Pridham soils are on nearly level, low fans and on valley plains. Slope ranges from 0 to 2 percent. Average annual precipitation is about 13 inches, and averge annual air temperature is about 62 degrees F.

Pridham soils are similar to the Gothard and Guest soils and are near Tubac, Comoro, Pima, and Grabe soils. Gothard soils do not have a mollic epipedon and are moderately well drained. Guest, Comoro, Pima, and Grabe soils do not have an argillic or natric horizon and are well drained. Tubac soils do not have a natric horizon and are well drained.

Typical pedon of Pridham silty clay loam, in Cochise County about 3 miles west of Arizona Highway 181 and south of Fivemile Creek in the Sulphur Springs Valley, 1,200 feet north and 400 feet east of SW corner sec. 19, T. 17 S., R. 28 E.:

A1—0 to 1 inch; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak thin platy structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine vesicular pores; neutral; abrupt smooth boundary.

B21t—1 to 8 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine and medium prismatic structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds and in pores; slightly effervescent; few fine light gray (10YR 7/2) soft lime masses; strongly alkaline; clear wavy boundary.

B22tca—8 to 22 inches; gray (10YR 5/1) silty clay, black (10YR 2/1) moist; moderate fine and medium prismatic structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine tubular and common very fine interstitial pores; common thin clay films on faces of peds and in pores; few very fine light yellowish brown (10YR 6/4) mottles; strongly effervescent; common fine light gray (10YR 7/2) soft lime masses; strongly alkaline; clear wavy boundary.

B23tca—22 to 29 inches; light brownish gray (10YR 6/2) silty clay, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; many very fine tubular and common very fine interstitial pores; few thin clay films on faces of peds; slightly effervescent; common light gray (2.5Y 7/2) soft lime masses; strongly alkaline; abrupt wavy boundary.

Cg—29 to 60 inches; mottled pale yellow (5Y 7/3) grayish brown (2.5Y 5/2) and light brownish gray (10YR 6/2) clay, pale olive (5Y 6/3) very dark grayish brown (2.5Y 3/2) and grayish brown (10YR 5/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; many very fine tubular pores; very slightly effervescent; moderately alkaline.

Thickness of the solum ranges from 20 to 40 inches. Coarse fragments make up 0 to 15 percent of the solum. Reaction is neutral to strongly alkaline.

The B2t horizon is gray and light brownish gray. It is silty clay or clay.

## Santo Tomas series

The Santo Tomas series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Santo Tomas soils are on high alluvial fans. Slope is dominantly 2 to 6 percent but, in places, ranges to 8 percent. Average annual precipitation is about 13 inches, and average annual air temperature is 63 degrees F.

Santo Tomas soils are similar to Comoro and Grabe soils and are near Atascosa, Chiricahua, Mokiak, and Comoro soils. Comoro and Grabe soils contain less than 35 percent coarse fragments in the control section. Atascosa soils have a lithic contact within a depth of 20 inches. Chiricahua soils are fine textured. Mokiak soils are moderately deep to bedrock and have a mesic temperature regime.

Typical pedon of Santo Tomas cobbly fine sandy loam in an area of Santo Tomas soils, in Cochise County 2.5 miles north of Government Peak, 500 feet east and 200 feet north of SW corner sec. 5, T. 14 S., R. 28 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and common fine roots; many very fine interstitial pores; 25 percent fine gravel and 5 percent cobbles; neutral; abrupt smooth boundary.

A12—2 to 8 inches; brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine roots; common very fine tubular pores; 25 percent fine and medium gravel and 5 percent cobbles; moderately alkaline; abrupt wavy boundary.

A13—8 to 36 inches; dark grayish brown (10YR 4/2) very gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; 60 percent fine, medium, and coarse gravel and 15 percent cobbles; moderately alkaline; clear wavy boundary.

C—36 to 60 inches; grayish brown (10YR 5/2) very gravelly fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, friable, nonsticky and nonplastic; many very fine and common fine and medium roots; many very fine and fine interstitial pores; 50 percent fine and medium gravel and 20 percent cobbles; moderately alkaline.

These soils are stratified with finer and coarser textured materials and are calcareous in some areas. The dark colored surface layer is more than 20 inches thick. Coarse fragments consist of cobbles and gravel in varying amounts and some stones.

The A horizon is grayish brown, brown, and dark grayish brown. It is cobbly fine sandy loam, gravelly loam, and very gravelly fine sandy loam. The C horizon is very gravelly fine sandy loam or gravelly loam.

## Signal series

The Signal series consists of very deep, well drained soils that formed in alluvium mainly from igneous rock. Signal soils are on dissected alluvial fans and valley slopes. Slope is dominantly 4 to 15 percent but ranges from 2 to 30 percent. Average annual precipitation is about 14 inches, and average annual air temperature is 62 degrees F.

Signal soils are similar to Tubac and White House soils and are near Comoro, Grabe, Pima, Tubac, and White House soils. All of these soils, except Signal soils, do not have a mollic epipedon. Comoro and Grabe soils have a coarse-loamy control section. Pima soils have a fine-silty control section.

Typical pedon of Signal gravelly loam, in Graham County 2.5 miles west of U.S. Highway 666, 800 feet east and 2,600 feet north of SW corner sec. 33, T. 11 S., R. 26 E.:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, dark brown (7.5YR 3/2) moist; weak medium platy structure; slightly hard, friable, sticky and slightly plastic; many very fine and few medium roots; many very fine interstitial and few very fine tubular pores; 40 percent fine and medium gravel; medium acid; abrupt wavy boundary.

B21t—2 to 7 inches; dark brown (7.5YR 3/2) very gravelly clay loam, dark reddish brown (5YR 2/2) moist; weak very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and tubular pores; common moderately thick clay films on faces of peds; 40 percent gravel and 10 percent cobbles; neutral; abrupt wavy boundary.

B22t—7 to 13 inches; reddish brown (5YR 4/3) very gravelly clay, dark reddish brown (5YR 3/3) moist; moderate fine and very fine subangular blocky structure; very hard, friable, sticky and very plastic; many very fine roots; many very fine interstitial and few very fine tubular pores; 45 percent gravel and 5 percent cobbles; common moderately thick clay films on faces of peds; mildly alkaline; clear wavy boundary.

B23t—13 to 22 inches; reddish brown (5YR 4/4) very gravelly clay, dark reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; common very fine roots; many very fine interstitial pores; 40 percent gravel; common moderately thick clay films on faces of peds; mildly alkaline; abrupt wavy boundary.

B3tca—22 to 32 inches; reddish brown (5YR 5/4) very gravelly sandy clay, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine interstitial pores; common thin clay films on faces of peds; 60 percent fine gravel, slightly effervescent; few fine white (5YR 8/1) soft lime masses; moderately alkaline; abrupt wavy boundary.

IIC1ca—32 to 42 inches; brown (7.5YR 5/4) and pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; very hard, friable, nonsticky and nonplastic; few very fine tubular pores; 50 percent fine gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IIC2—42 to 60 inches; strong brown (7.5YR 5/6) very gravelly loamy sand, dark brown (7.5YR 4/4) moist; massive; hard, friable, nonsticky and nonplastic; few very fine tubular pores; 50 percent fine gravel; moderately alkaline.

Thickness of the solum is 15 to 36 inches. Thickness of the mollic epipedon is 12 inches or more. Coarse fragment content averages more than 35 percent.

The A horizon is dark grayish brown or brown. It is gravelly loam or cobbly loam. The B2t horizon is dark brown and reddish brown. It is very gravelly clay loam, very gravelly clay, and very gravelly sandy clay. The C1 horizon has a zone of lime accumulation and is weakly cemented in places.

## Sonoita series

The Sonoita series consists of very deep, well drained soils that formed in alluvium derived from acid igneous rock. Sonoita soils are on alluvial fans and valley slopes. Slope ranges from 0 to 5 percent. Average annual precipitation is about 10 inches, and average annual air temperature is 63 degrees F.

Sonoita soils are similar to Bucklebar and Dona Ana soils and are near Anthony, Comoro, Continental, Grabe, Pima, Tres Hermanos, Tubac, Bucklebar, and Dona Ana soils. Bucklebar, Tres Hermanos, and Dona Ana soils have a fine-loamy control section. Anthony, Comoro, Grabe, and Pima soils do not have an argillic horizon. Continental and Tubac soils have a fine-textured argillic horizon.

Typical pedon of Sonoita gravelly sandy loam, in Graham County 0.2 mile west of U. S. Highway 666, 950 feet north and 800 feet west of SE corner sec. 9, T. 10 S., R. 26 E.:

A1—0 to 3 inches; light reddish brown (5YR 6/3) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak medium and thick platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; 20 percent fine gravel; slightly acid; abrupt wavy boundary.

B21t—3 to 12 inches; reddish brown (5YR 6/3) gravelly sandy loam, dark reddish brown (5YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; common very fine tubular pores; few thin clay bridges on sand grains; 20 percent fine gravel; mildly alkaline; clear wavy boundary.

B22t—12 to 23 inches; reddish brown (5YR 5/3) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; common very fine interstitial pores; few thin clay bridges on sand grains; 30 percent fine gravel; moderately alkaline; abrupt wavy boundary.

B3tca—23 to 33 inches; brown (7.5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; slightly hard and hard, very friable, slightly sticky and nonplastic; common very fine roots; common very fine tubular pores; few thin clay films on faces of peds; 20 percent fine gravel; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cca—33 to 43 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common fine interstitial and few very fine tubular pores; 10 percent fine gravel; slightly effervescent; few very fine pinkish white (5YR 8/2) lime filaments; moderately alkaline; abrupt wavy boundary.

IIB2tcab—43 to 50 inches; mottled reddish brown (5YR 5/4) and yellowish red (5YR 5/6) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure appearing massive in place; hard and very hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; few thin clay films on faces of peds; 30 percent fine gravel; very slightly effervescent; common fine pink (5YR 7/3) lime filaments; moderately alkaline.

Thickness of the solum is 30 inches or more. Depth to the weak zone of lime accumulation is 20 to 40 inches. Reaction is slightly acid to moderately alkaline.

The A horizon is light reddish brown or light brown. It is gravelly sandy loam or fine sandy loam. The B2t horizon is reddish brown and brown. It is gravelly sandy loam or sandy loam. The C horizon is reddish brown, light reddish brown, or reddish brown and yellowish red. It is fine sandy loam, gravelly sandy clay loam, or gravelly sandy loam.

## Tres Hermanos series

The Tres Hermanos series consists of very deep, well drained soils that formed in old alluvium from basic igneous rock. Tres Hermanos soils are on alluvial terraces and old alluvial fans. Slope ranges from 0 to 3 percent. Average annual precipitation is about 10 inches, and average annual air temperature is about 64 degrees F.

Tres Hermanos soils are similar to the Dona Ana and Sonoita soils and are near Artesia, Gila, Anthony, Arizo, Dona Ana, and Sonoita soils. Dona Ana soils have less than 15 percent coarse fragments in the control section. Sonoita soils do not have a calcic horizon within a depth of 40 inches. Artesia soils have a duripan within a depth of 39 inches. Gila, Anthony, and Arizo soils do not have an argillic horizon.

Typical pedon of Tres Hermanos gravelly loam, in Graham County about 1.5 miles southeast of San Jose, 2,200 feet south and 1,200 feet east of NW corner sec. 27, T. 7 S., R. 27 E.:

A1—0 to 3 inches; pink (5YR 7/3) gravelly loam, reddish brown (5YR 5/3) moist; weak thin and medium platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine vesicular pores; 20 percent fine and medium gravel; very slightly effervescent; moderately alkaline; abrupt wavy boundary.

B21tca—3 to 11 inches; reddish brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable sticky and plastic; many very fine roots, common very fine interstitial pores; common thin clay films on faces of peds; 20 percent fine gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

B22tca—11 to 19 inches; reddish brown (5YR 5/4) gravelly loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; few very fine tubular and common very fine interstitial pores; few thin clay films on faces of peds; 30 percent fine gravel; strongly effervescent;

few very fine lime filaments; moderately alkaline; abrupt wavy boundary.

C1ca—19 to 25 inches; pink (5YR 8/3) and light reddish brown (5YR 6/3) gravelly loam, light reddish brown (5YR 6/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 30 percent fine lime-coated gravel; violently effervescent; strongly alkaline; clear wavy boundary.

C2ca—25 to 60 inches; pink (5YR 7/3) gravelly fine sandy loam, light reddish brown (5YR 6/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 40 percent fine and medium lime-coated gravel; violently effervescent; strongly alkaline.

Thickness of the solum ranges from 12 to 30 inches. Coarse fragments make up 15 to 35 percent of the solum. Reaction is mildly alkaline to strongly alkaline.

The A horizon is pink, light reddish brown, or light brown. The B2t horizon is reddish brown or light reddish brown. It is gravelly clay loam and gravelly loam.

## Tubac series

The Tubac series consists of very deep, well drained soils that formed in old mixed alluvium. Tubac soils are on old alluvial fans and terraces. Slope ranges from 0 to 5 percent. Average annual precipitation is about 11 inches, and average annual air temperature is about 65 degrees F.

Tubac soils are similar to Continental and Forrest soils and are near Forrest, White House, Sonoita, and Bucklebar soils. Continental soils do not have an albic horizon. Forrest and White House have more than 1 percent organic matter in the upper part of the solum. Sonoita soils are coarse-loamy, and Bucklebar soils are fine-loamy.

Typical pedon of Tubac gravelly sandy loam in an area of Tubac soils, in Cochise County about 6 miles southeast of Bowie, 700 feet south and 50 feet west of NE corner sec. 31, T. 13 S., R. 29 E.:

A1—0 to 3 inches; light reddish brown (5YR 6/4) gravelly sandy loam, reddish brown (5YR 4/4) moist; weak thin and medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many fine vesicular pores; 15 percent fine gravel; neutral; abrupt smooth boundary.

A2—3 to 6 inches; light brown (7.5YR 6/4) gravelly loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 20 percent fine gravel; noneffervescent; neutral; abrupt wavy boundary.

B21t—6 to 13 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/3) moist; moderate fine prismatic structure parting to strong fine and medium angular blocky; hard and very hard, firm, sticky and very plastic; common very fine and fine roots; few very fine tubular and interstitial pores; many moderately thick clay films on faces of peds; noneffervescent; moderately alkaline; clear smooth boundary.

B22t—13 to 25 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and very plastic; common very fine roots; few very fine tubular and interstitial pores; common moderately thick clay films on faces of peds; slightly effervescent; moderately alkaline; clear wavy boundary.

B23tca—25 to 36 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; common fine and medium angular blocky structure; hard, friable, sticky and very plastic; few very fine and fine roots; few very fine tubular and interstitial pores; common moderately thick clay films on faces of peds; common pinkish white (5YR 8/2) and light reddish brown (5YR 6/3) soft lime masses; moderately alkaline; clear wavy boundary.

B3tca—36 to 48 inches; reddish yellow (5YR 6/6) and reddish brown (5YR 4/4) clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; many very fine tubular pores; few thin clay films on faces of peds and in pores; violently effervescent; many fine pink (5YR 8/3) soft lime masses; moderately alkaline.

Thickness of the solum is more than 40 inches. Coarse fragments make up 0 to 35 percent of the solum. Reaction is neutral to strongly alkaline.

The A horizon is light reddish brown, reddish brown, light brown, or brown. It is gravelly sandy loam, sandy loam, gravelly loam, or sandy clay.

## Vekol series

The Vekol series consists of very deep, well drained soils that formed in alluvium derived from mixed sources. Vekol soils are on alluvial fans and terraces. Slope ranges from 0 to 2 percent. Average annual precipitation is about 8 inches, and average annual air temperature is 62 degrees F.

Vekol soils are similar to Continental, Forrest, Tubac, and White House soils and are near Guest and Hondale soils. Continental soils have a B2t horizon with moderate or strong structure and are noncalcareous in the upper part of the solum. Forrest soils average more than 1 percent organic matter to a depth of 15 inches and have a calcic horizon. Tubac soils have an abrupt textural boundary from the A horizon to the B horizon. White

House soils have more than 1 percent organic matter to a depth of 15 inches. Guest soils do not have an argillic horizon. Hondale soils have a fine-textured natric horizon.

Typical pedon of Vekol loam, in Cochise County 1.1 miles south of Interstate-10, 1,200 feet east and 1,800 feet north of SW corner sec. 3, T. 14 S., R. 31 E.:

Ap—0 to 10 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak thin and medium platy structure on surface, weak fine granular structure below; soft, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; few very fine interstitial pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

B21t—10 to 22 inches; reddish brown (5YR 5/4) clay loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; strongly effervescent; moderately alkaline; clear wavy boundary.

B22tca—22 to 36 inches; reddish brown (5YR 5/4) clay, dark reddish brown (5YR 3/4) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; common thin clay films on faces of peds; strongly effervescent; common fine and few medium white (5YR 8/1) soft lime masses; strongly alkaline; clear wavy boundary.

B23tca—36 to 47 inches; light reddish brown (5YR 6/3) heavy clay loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; few thin clay films on faces of peds; strongly effervescent; common fine white (5YR 8/1) soft lime masses; moderately alkaline; abrupt smooth boundary.

IICca—47 to 54 inches; brown (7.5YR 5/4) gravelly sandy clay loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine tubular pores; 40 percent fine gravel; strongly effervescent; common fine pinkish white (7.5YR 8/2) soft lime masses; moderately alkaline.

Thickness of the solum is 35 to 48 inches. The soil is calcareous throughout.

The A horizon is brown or light brown. The B2t horizon is reddish brown and light reddish brown. It is clay loam and clay.

## White House series

The White House series consists of very deep, well drained soils that formed in alluvium from igneous and sedimentary rock. White House soils are on alluvial fans and valley plains. Slope generally ranges from 2 to 10 percent but, in places, ranges to 20 percent. Average annual precipitation is about 14 inches, and average annual air temperature is 62 degress F.

White House soils are similar to Continental, Forrest, and Tubac soils and are near Atascosa, Chiricahua, Kimbrough, Forrest, and Tubac soils. Continental soils have less than 1 percent organic matter in the surface horizon. Forrest soils have a calcic horizon. Tubac soils have an abrupt textural change from the A horizon to the B horizon. Atascosa soils have more than 35 percent coarse fragments in the control section and are shallow to bedrock. Chiricahua soils are moderately deep over bedrock. Kimbrough soils do not have an argillic horizon and have a lime-cemented pan at a shallow depth.

Typical pedon of White House gravelly loam in an area of White House-Forrest association, in Cochise County 0.1 mile northwest of Arizona Highway 181, 2,000 feet north and 1,000 feet west of SE corner sec. 2, T. 17 S., R. 28 E.:

A1—0 to 2 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/2) moist; weak thin and medium platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine interstitial and many very fine tubular pores; medium acid; abrupt wavy boundary.

B1t—2 to 7 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; medium acid; clear wavy boundary.

B21t—7 to 19 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; weak medium prismatic structure; very hard, friable, sticky and plastic; many very fine roots; common very fine interstitial and tubular pores; many moderately thick clay films on faces of peds; moderately alkaline; clear wavy boundary.

B22t—19 to 28 inches; yellowish red (5YR 4/5) clay, reddish brown and yellowish red (5YR 4/4 and 4/6) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; many moderately thick clay films on faces of peds; moderately alkaline; abrupt wavy boundary.

B23tca—28 to 40 inches; yellowish red (5YR 4/6) gravelly clay, yellowish red (5YR 4/6) moist; moderate fine and medium subangular blocky and angular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular and interstitial pores; common moderately thick clay films on faces of peds; few very fine lime masses; 20 percent fine and medium gravel; slightly effervescent; moderately alkaline; clear wavy boundary.

B24tca—40 to 50 inches; yellowish red (5YR 5/6) gravelly clay, yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; many very fine interstitial pores; few fine pinkish white (5YR 8/2) lime masses, pink (5YR 7/4) moist; 35 percent fine and medium gravel; few thin clay films on faces of peds; slightly effervescent; moderately alkaline.

Thickness of the solum is 40 inches or more. Coarse fragment content ranges from a trace to 35 percent.

The A horizon is brown. It is gravelly loam or gravelly sandy loam. The B2t horizon is reddish brown and yellowish red. It is clay loam, clay, and gravelly clay.

# Formation and morphology of the soils

In this section, the processes of soil formation are discussed and related to the soils in the survey area. Also discussed in this section is morphology of the soils.

## Formation

Lacustrine deposits that are mapped in this area as Calciorthids and Torriorthents, eroded, indicate that the San Simon Valley was a closed basin at one time. In this aspect, it was similar to the Willcox Playa to the west and to other playas to the east in the vicinity of Lordsburg, New Mexico. Studies made of the Willcox Playa indicate that the lacustrine material was laid down in Pleistocene Lake Cochise. It can be assumed that the lacustrine materials in the San Simon Area were laid down at approximately the same time. Soils on the alluvial fans formed, in part, during the Wisconsin pluvial period. Some soils, however, may be much older.

Soils in the survey area have been influenced during their formation by five factors: parent material, climate, plant and animal life, relief, and time. Of these five factors, climate probably has had a dominanting influence on formation of the soils. This is mainly because of the changes in climate during the Pleistocene and Recent Epochs.

### Parent material

The mountain ranges that border and are in the survey area contain many kinds of rock, such as basalt, granite, andesite, rhyolite, volcanic tuff, quartzite, and limestone. Erosion debris from these mountains makes up the fan materials of the valley slopes. The soils reflect the kind of debris that dominate the materials in which they formed. Kimbrough and Cave soils formed in materials dominantly from limestone. Bonita and Graham soils formed in materials dominantly from basalt. White House, Tubac, and Continental soils formed in mixed materials dominantly from such acid igneous rock as granite and rhyolite. Soils of the Forrest series formed in materials that are dominantly acid igneous but that are strongly influenced by materials derived from limestone. The Gothard and the Hondale soils formed in highly mixed materials. They contain evidence of the influence of poor drainage, probably reflecting the time when the lake was present in the area.

### Climate

Because of the changes from Pleistocene to the present, climate has probably had a dominating influence on soil formation in the survey area. Studies made in nearby Willcox Playa indicate that several pluvial periods have occurred and that during a period annual precipitation exceeded 30 inches.

Climate has a strong influence on soil formation. Heat and moisture greatly influence the kind of vegetation that grows and the rates at which organic matter decomposes and minerals weather. Heat and moisture also strongly affect the rates of removal and accumulation of material in soil horizons.

In the survey area, most of the annual precipitation occurs during July, August, and September. Winters are cool and slightly moist. By late in spring the soils are generally dry, and growth of grasses and shrubs generally stops. Rapid growth occurs with the coming of rains in summer.

The hot summers bring about a rapid breakdown of organic matter. This, along with the limited growth period of the plants, tends to prevent accumulation of organic matter in the soils.

The ranges in precipitation and temperature are too limited to account for all the soil differences in the survey area. Because of this, many of the more strongly developed soils are thought to have developed during times when wider ranges in precipitation and temperature were more conducive to soil formation. The younger soils that are forming under present conditions have a light colored surface layer that has massive or weak structure, are moderately alkaline to very strongly alkaline, and have underlying material that is calcareous and moderately alkaline to very strongly alkaline. Older soils, higher on the fans, have a dark colored surface layer that has moderate structural development and a well developed subsoil. The subsoil is generally neutral in the upper part and moderately alkaline with accumulated carbonates in the lower part.

### Plant and animal life

Plants that are tolerant of saline and alkali conditions occur along the axis of the San Simon Valley where the influence of the ancient lake is still evident. Desert grasses and shrubs are on the fan slopes that extend from the valley axis toward the foothills. Chaparral, oak, juniper, and some pinyon pine are on the foothills and low mountains.

Soils that are in swales and on flood plains and receive extra moisture by runoff from higher areas support a lush growth of vegetation. This brings about an accumulation of organic matter, thus creating soils that have a dark colored surface layer. Pima, Grabe, Comoro, and Santo Tomas soils are examples of these soils. Soils that are on uplands on fans lose some of the precipitation through runoff. Vegetation is less dense and is made up of desert shrubs and grasses. Less plant residue is produced, and decomposition is rapid. Soils under these conditions have a light colored surface layer. Anthony, Bucklebar, Continental, Sonoita, Tres Hermanos, Tubac, and Vekol soils are examples of soils under these conditions.

Precipitation is sufficient on the foothills and mountains to produce enough vegetation and organic matter to make a dark colored surface layer. Such soils as Atascosa, Chiricahua, Faraway, Graham, Kimbrough, Mabray, Mokiak, Signal, and White House are examples of this.

Small animals, earthworms, insects, and micro-organisms also influence the formation of soils. They mix organic matter into the soil and help break down the remains of plants. Rodents burrowing into the soil tend to mix the layers. Earthworms and other invertebrata feed on the organic matter in the upper few inches of the soil, especially in the dark colored soils. Bacteria, fungi, algae, actiomycetes, and other micro-organisms help decompose plant remains and hasten the weathering of rock. Also, the remains of the fauna tend to add to the organic-matter content of the soil.

### Relief

Relief, through its effect on drainage, erosion, and sedimentation, has influenced soil formation in the survey area. Soils are finer textured along the axis of valley areas. Salts have accumulated in some soils, and in some soils carbonates are high. Also in these areas are soils that are subject to frequent flooding. Vegetation is lush where the soils are flooded. Where soils are saline and alkali, only plants that are tolerant of a high salt content or alkali condition exist.

On the fans and in slightly higher areas, the soils have better drainage and are free of salts and harmful amounts of alkali. Carbonates are generally leached to the subsoil. Vegetation is made up of desert shrubs and grasses.

Soils on the foothills and mountains are generally slightly acid to neutral and are free of salts. Some carbonates may be present, but they are generally on the surface of the bedrock or along fracture plains in the bedrock. These soils are generally dark colored and are relatively high in content of organic matter.

### Time

Soils form more slowly in the hot, arid desert than in more humid areas because there is less water for weathering, for leaching of weathering products, and for translocating clay. Soil properties change only slowly with time under the present climatic regime. The great differences in the properties of the Tubac and Glendale soils would require great differences in time, if time alone were the difference. A combination of time and climate, however, could account for these differences. Tubac soils are assumed to have formed in pluvial periods of Wisconsin and Illinoian ages. Glendale soils, however, formed under the present climatic regime.

## Morphology

Such soils as the Gothard and Hondale soils and Calciorthids and Torriorthents formed in lakelaid materials that probably were deposited at about the same time as the Lake Cochise deposits. Subsequent entrenchment and drainage and the overwash of sediment from neighboring mountains obscured this lake, leaving only the lacustrine deposit as evidence. The Bluepoint soils to the east of this lake area probably represent beach sands that have been moved to their present position by the prevailing winds.

Well developed soils are on the higher parts of the fans. These soils apparently formed during the pluvial period that produced the lake. The Signal, Eba, White House, Tubac, and Continental soils are good examples of such soils.

Intermediate on the fan slopes and in the fan materials that were laid in over the lakelaid sediments are such soils as the Anthony, Sonoita, Comoro, Pima, Grabe, Gila, and Glendale soils. These soils have only slight profile development and probably represent soils that formed since the last pluvial period under a climate regime much like the present one.

On the foothills and mountains are soils that show various stages of development. Most of these soils are shallow or very shallow. Some have a clay subsoil. Most of the soils that have a clay subsoil are old soils that probably formed during the last pluvial period. Shallow soils that do not have a clay subsoil are generally on the steeper slopes. Here, geologic removal has kept pace with rock weathering so that a clay subsoil has not had a chance to form. The Atascosa, Chiricahua, Faraway, Mabray, and Mokiak soils are examples of this.

Shallow soils that have an indurated lime pan are on fan slopes below limestone hills or where limestone hills once existed. Such soils as the Cave and Kimbrough soils are examples.

Soils that have a silica-cemented pan are in areas where significant amounts of tuff and ash are present. Artesia soils and Durorthids are examples.

Several pluvial periods occurred during Wisconsin and Illinoian ages. This is indicated by the presence of several well developed soil profiles, superimposed one on the other, high on the fan slopes above the Willcox Playa. The Pridham soils are a result of this sequence of well developed soils. Water from melting snow in the mountains and runoff from summer showers in the mountains infiltrate the soils high on the fan. Moisture penetrates only to the top of the B horizon of the buried, developed soil and, then moves laterally down the fan slope toward the playa. Since the buried B horizon is essentially on the level, it eventually emerges to the surface and blends with the B horizon of the overlying profile. The perched water table has gleyed the B horizon of the overlying soil, thus producing the Pridham soils.

## References

(1) American Association of State Highway (and Transportation) Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. (Supplements replacing pp. 173-188 issued May 1962)

(4) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436, 754 pp., illus.

## Glossary

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Area reclaim.** An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Association, soil.** A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

| | *Inches* |
|---|---|
| Very low | 0 to 3 |
| Low | 3 to 6 |
| Moderate | 6 to 9 |
| High | More than 9 |

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bottom land.** The normal flood plain of a stream, subject to frequent flooding.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

**Cobblestone (or cobble).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Cutbanks cave.** Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

**Depth to rock.** Bedrock at a depth that adversely affects the specified use.

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

*Well drained.*—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

*Moderately well drained.*—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

*Somewhat poorly drained.*—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

*Poorly drained.*—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

*Very poorly drained.*—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

**Erosion.** The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

**Excess sodium.** Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

**Excess fines.** Exoess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

**Excess salts.** Excess water soluble salts. Excessive salts restrict the growth of most plants.

**Fast intake.** The rapid movement of water into the soil.

**Favorable.** Favorable soil features for the specified use.

**Flooding.** The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

*A horizon.*—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

*A2 horizon.*—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

*R layer.*—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are—

*Border.*—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

*Basin.*—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

*Controlled flooding.*—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

*Corrugation.*—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

*Furrow.*—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

**Large stones.** Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Low strength.** Inadequate strength for supporting loads.

**Munsell notation.** A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Percs slowly.** The slow movement of water through the soil adversely affecting the specified use.

**Permeability.** The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

**pH value.** (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

**Piping.** Moving water of subsurface tunnels or pipelike cavities in the soil.

**Plastic limit.** The moisture content at which a soil changes from a semisolid to a plastic state.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Reaction, soil.** The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

| | *pH* |
|---|---|
| Extremely acid | Below 4.5 |
| Very strongly acid | 4.5 to 5.0 |
| Strongly acid | 5.1 to 5.5 |
| Medium acid | 5.6 to 6.0 |
| Slightly acid | 6.1 to 6.5 |
| Neutral | 6.6 to 7.3 |
| Mildly alkaline | 7.4 to 7.8 |
| Moderately alkaline | 7.9 to 8.4 |
| Strongly alkaline | 8.5 to 9.0 |
| Very strongly alkaline | 9.1 and higher |

**Rooting depth.** Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

**Rooting depth, observed.** The depth to which the majority of the plant roots penetrate the soil; i.e., that depth where the number of roots observed changes from many or common to few.

**Saline soil.** A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Seepage.** The rapid movement of water through the soil. Seepage adversely affects the specified use.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

**Slow intake.** The slow movement of water into the soil.

**Slow refill.** The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones.** Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

**Soil.** A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

**Surface soil.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer.** Otherwise suitable soil material too thin for the specified use.

**Topsoil** (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

**Water supply capacity.** Available water in the soil at the start of the growing season plus precipitation, less runoff and evaporation, *or* plus run-on from higher lying areas.

**Water table.** The upper limit of the soil or underlying rock material that is wholly saturated with water.

*Water table, apparent.* A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

*Water table, artesian.* A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

*Water table, perched.* A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

# ILLUSTRATIONS

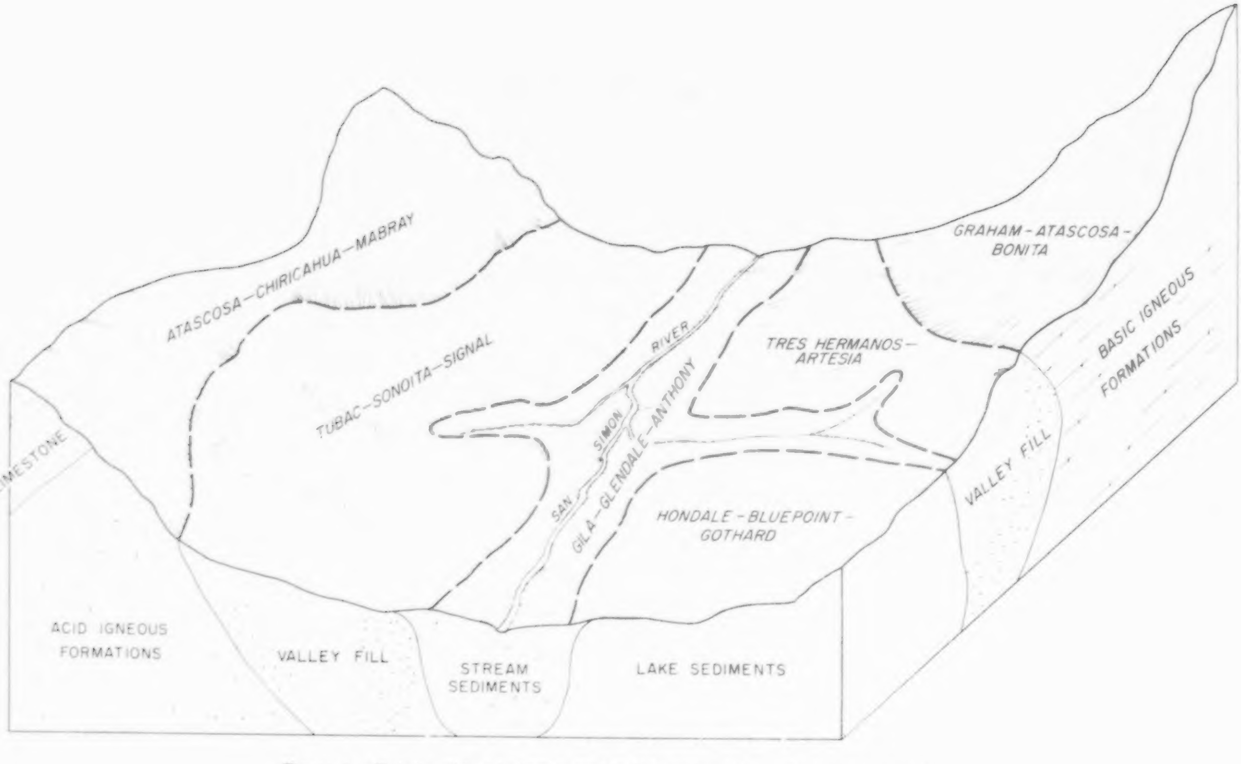

ATASCOSA–CHIRICAHUA–MABRAY
TUBAC–SONOITA–SIGNAL
SAN SIMON RIVER
GILA–GLENDALE–ANTHONY
TRES HERMANOS–ARTESIA
GRAHAM-ATASCOSA-BONITA
HONDALE-BLUEPOINT-GOTHARD
LIMESTONE
BASIC IGNEOUS FORMATIONS
VALLEY FILL
ACID IGNEOUS FORMATIONS
VALLEY FILL
STREAM SEDIMENTS
LAKE SEDIMENTS

*Figure 1.*—Relationship of physiographic features, soils, and parent materials.

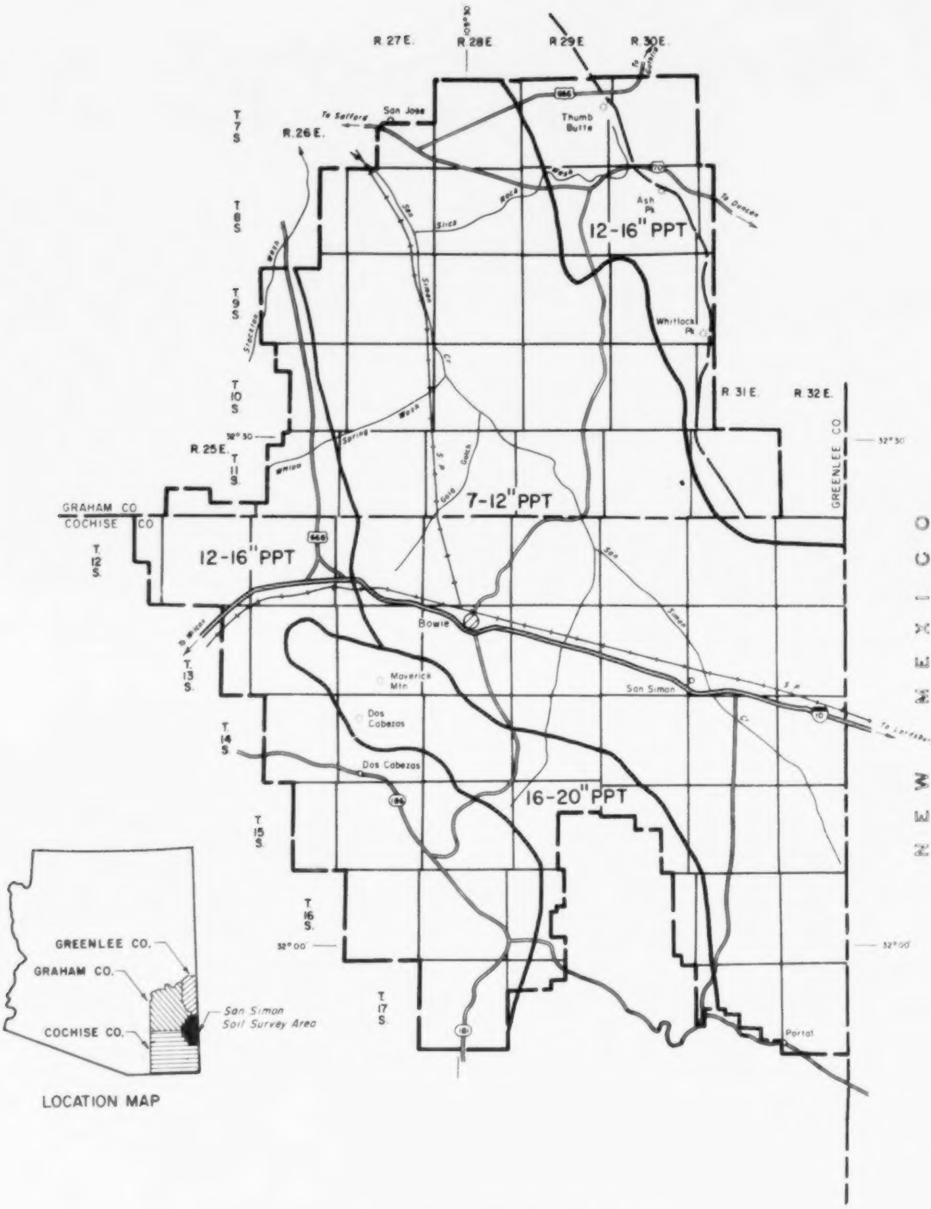

R. 27 E.
R. 28 E.
R. 29 E.
R. 30 E.
To Safford
San Jose
R. 26 E.
Thumb Butte
To Duncan
Ash Pk.
12-16" PPT
Whitlock Pk.
R. 31 E.
R. 32 E.
T. 7 S.
T. 8 S.
T. 9 S.
T. 10 S.
T. 11 S.
T. 12 S.
T. 13 S.
T. 14 S.
T. 15 S.
T. 16 S.
T. 17 S.
R. 25 E.
32° 30'
San Simon Cr.
Slick Rock Wash
Stockton Wash
Spring Wash
Willow
Gold Gulch
GRAHAM CO.
COCHISE CO.
GREENLEE CO.
7-12" PPT
12-16" PPT
Bowie
Maverick Mtn.
Dos Cabezos
Dos Cabezos
San Simon
To Lordsburg
To Willcox
16-20" PPT
32° 00'
Portal
NEW MEXICO
GREENLEE CO.
GRAHAM CO.
COCHISE CO.
San Simon Soil Survey Area
LOCATION MAP

*Figure 2.*—Precipitation zones in the soil survey area.

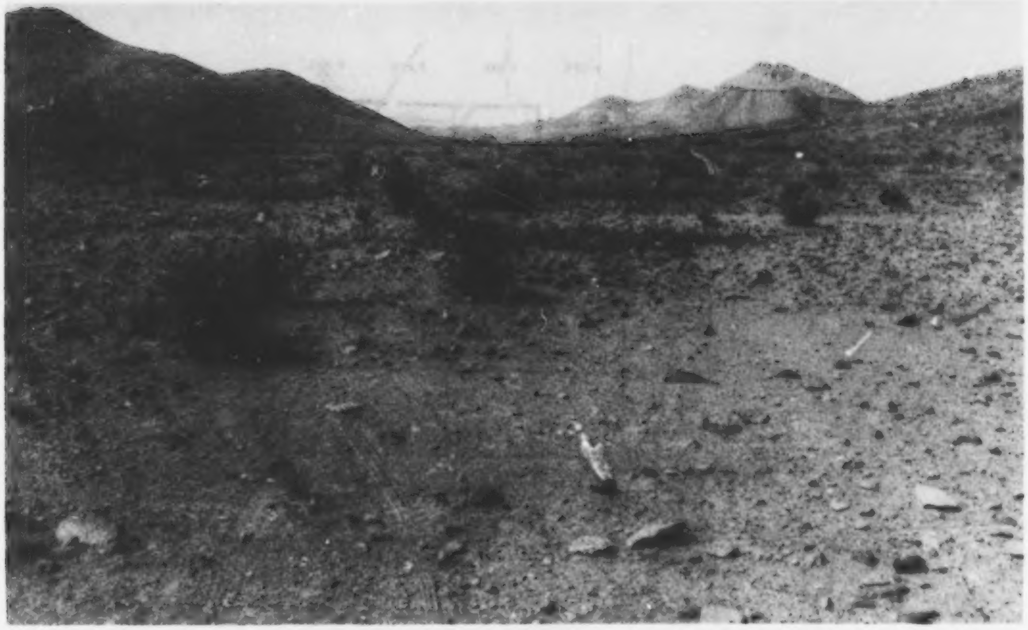


*Figure 3.*—An area of Artesia cobbly fine sandy loam in foreground. Graham-Rock outcrop complex is on hills in background.

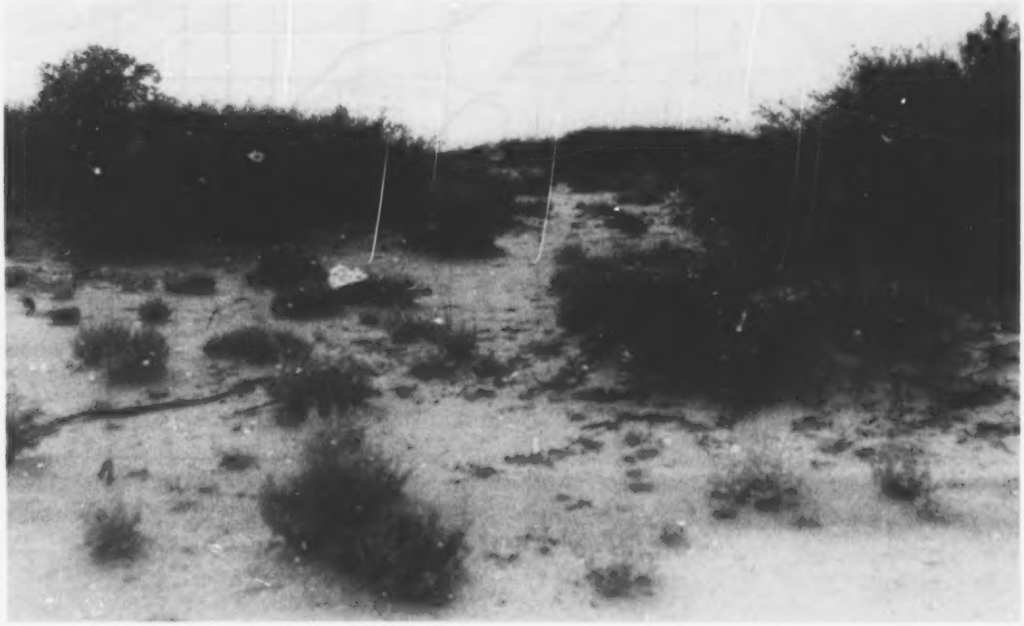


*Figure 4.*—An area of Bluepoint-Gothard complex. Bluepoint loamy sand is on dunes, and Gothard fine sandy loam is in level areas.

*Figure 5.*—Bonita cobbly silty clay under grass cover on the right and Cave-Durorthids complex under creosotebush cover on the left.

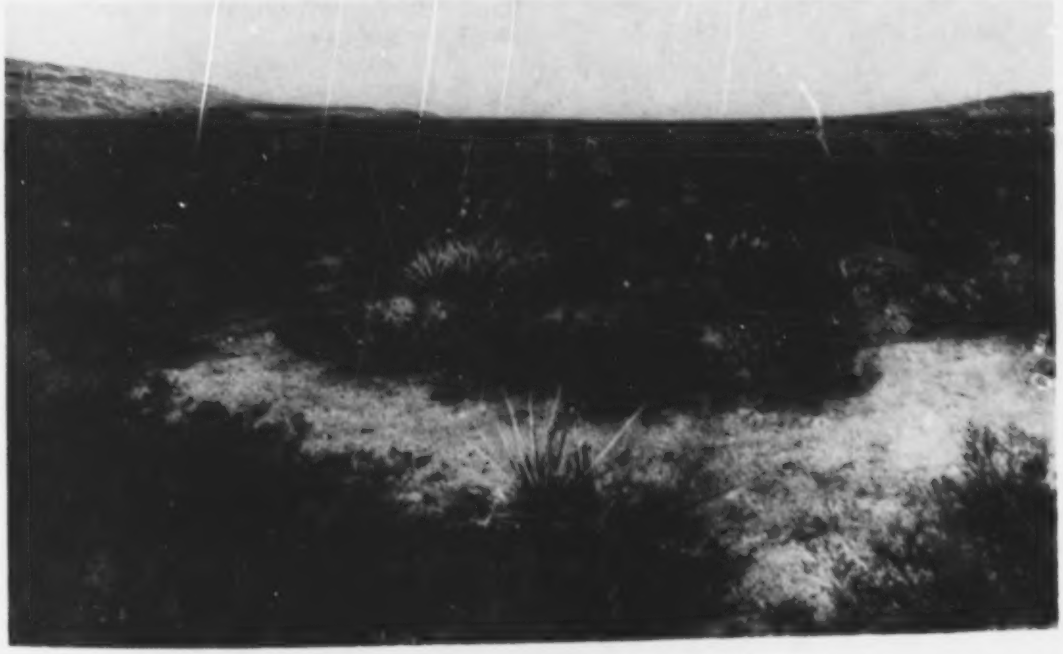


*Figure 6.*—An area of Cave-Durorthids complex under typical ground cover.

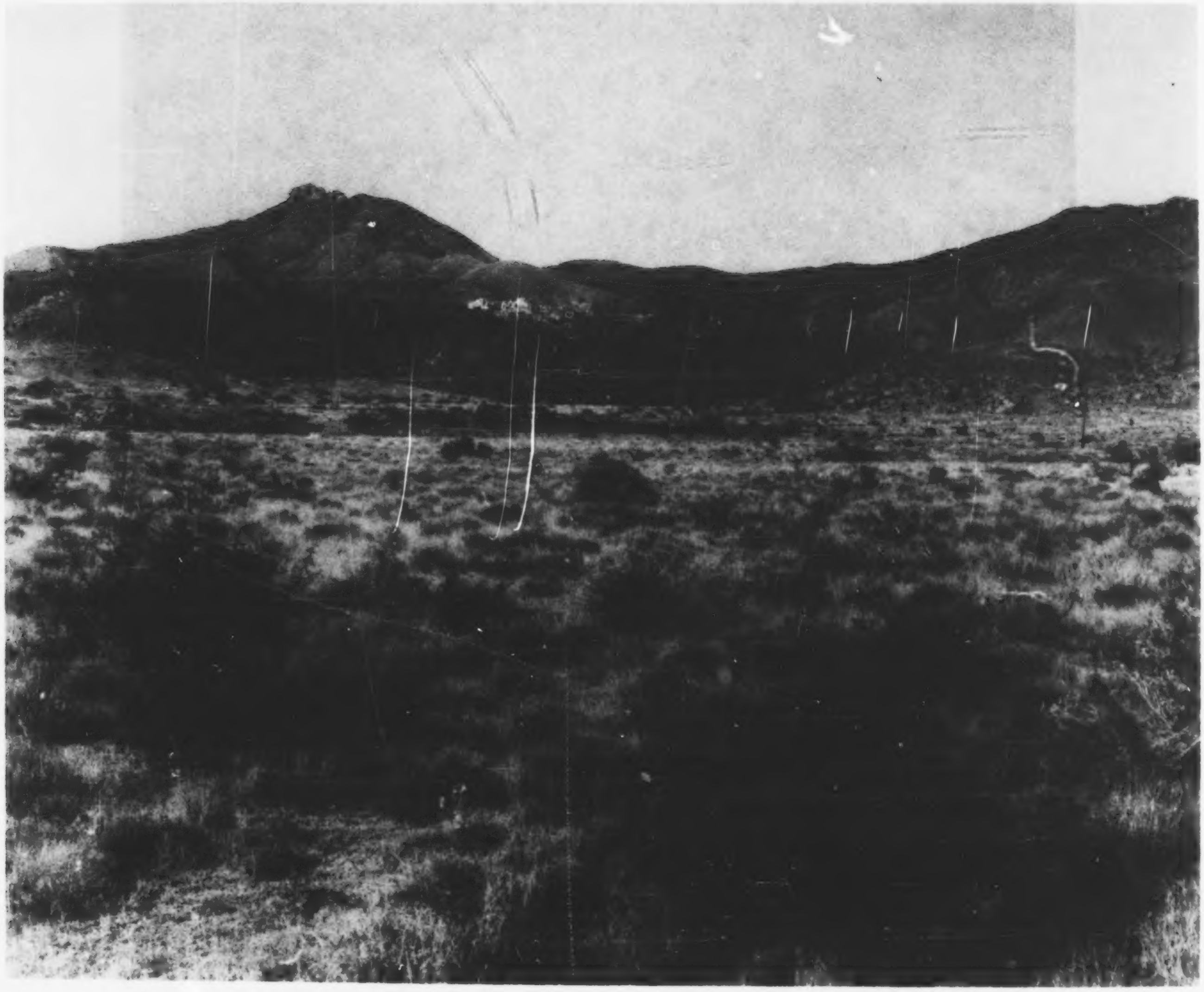


*Figure 7.*—An area of Comoro soils under good grass cover in foreground. Mokiak-Faraway-Rock outcrop complex is on hills in background.

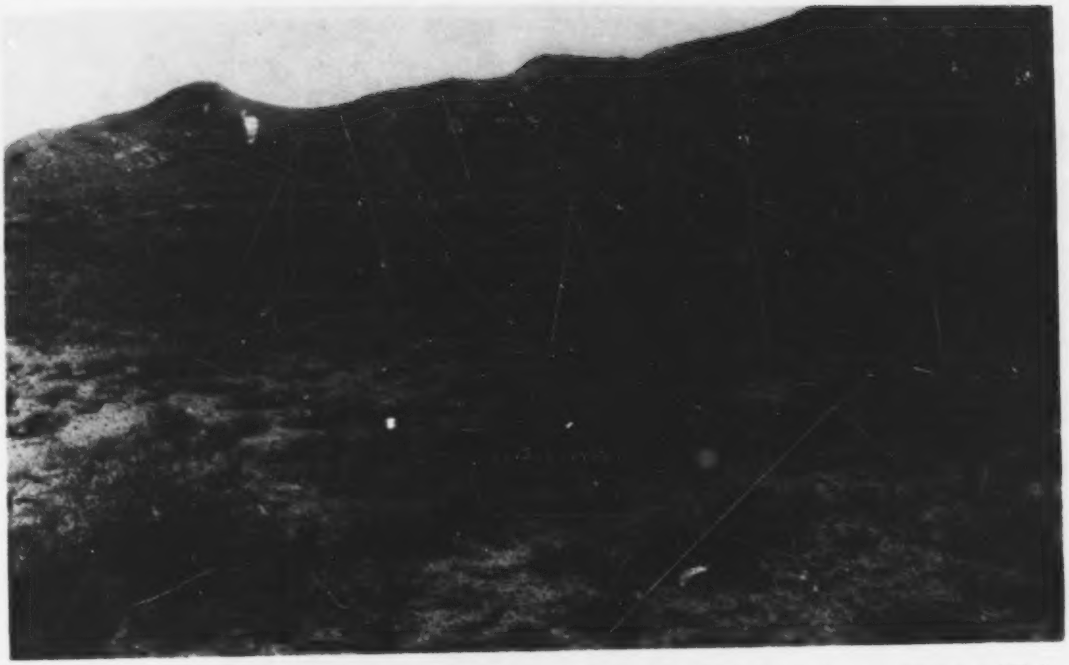


*Figure 8.*—An area of Eba gravelly sandy loam in foreground. Atascosa-Chiricahua-Rock outcrop complex is on hills in background.

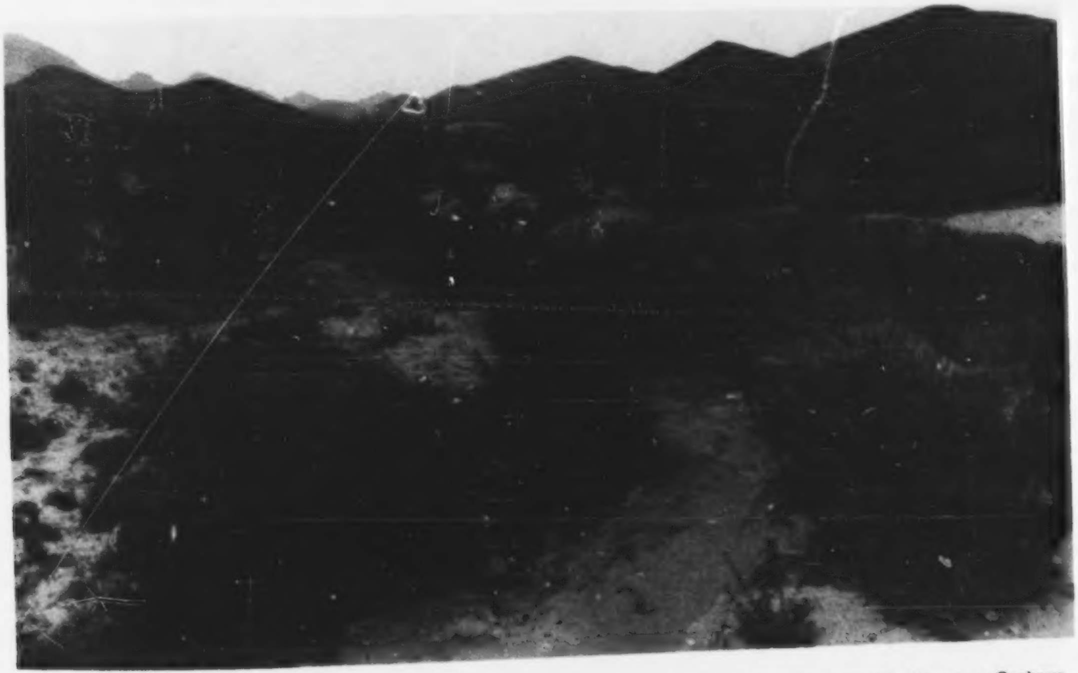


*Figure 9.*—An area of Glendale-Gila complex, eroded. Cave-Durorthids complex is on terrace in center. Atascosa-Graham-Rock outcrop complex is on hills in background.

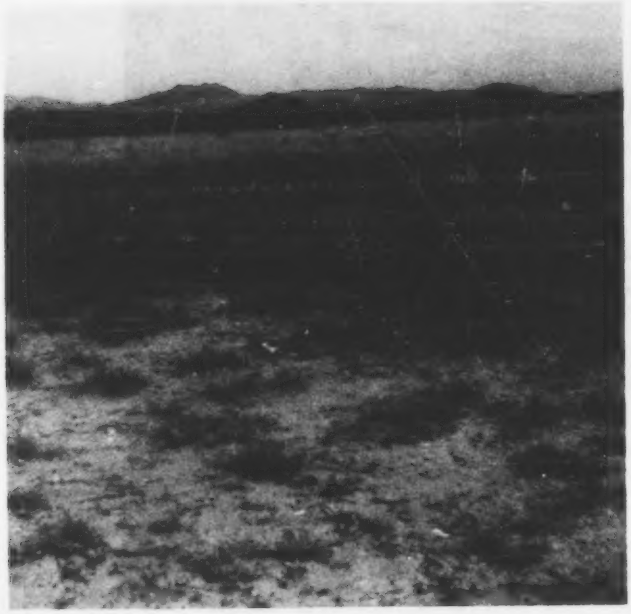


*Figure 10.*—An area of Glendale-Gila association, frequently flooded, under good grass cover.

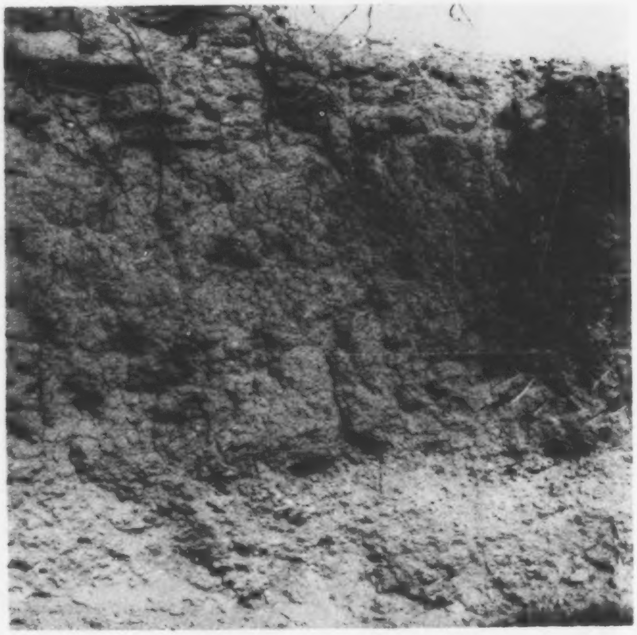


*Figure 11.*—Profile of Guest silty clay loam.

*Figure 12.*—Alfalfa in an area of Hondale silty clay loam.

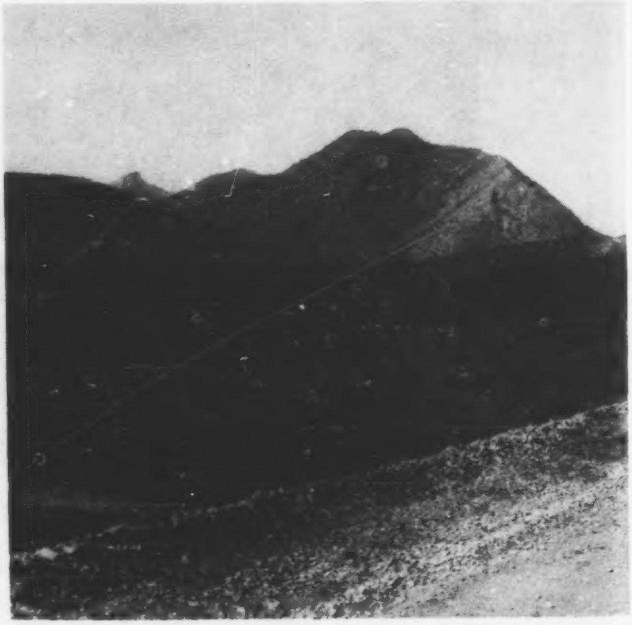


*Figure 13.*—Kimbrough gravelly fine sandy loam in foreground. Mabray-Rock outcrop complex on hills in background.

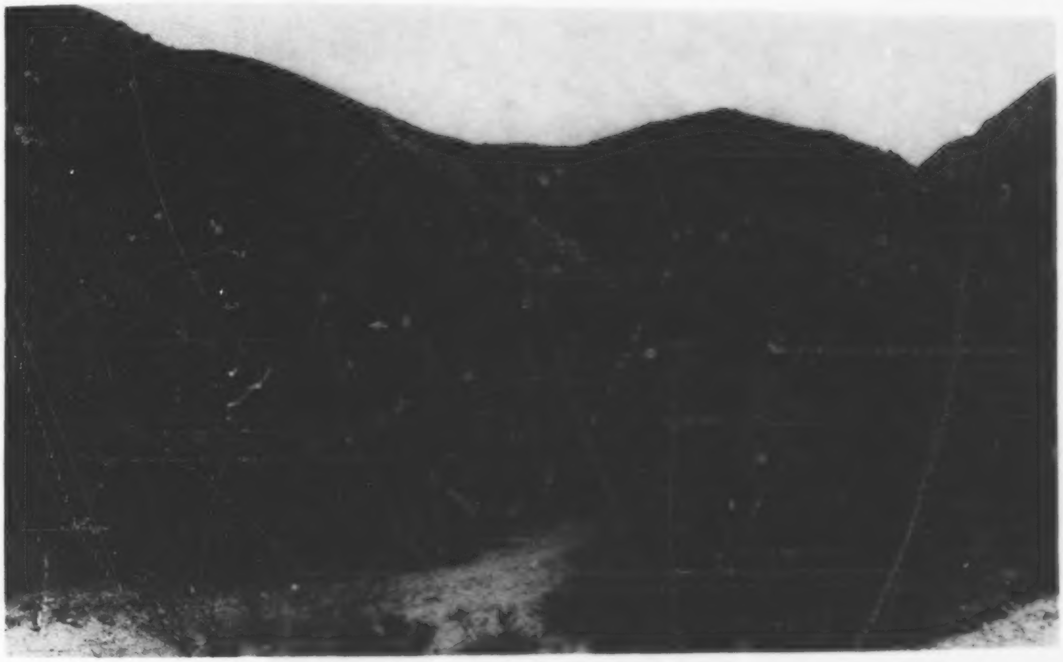


*Figure 14.*—Mabray Rock outcrop complex is on hills. Santo Tomas soils are along drainageways.

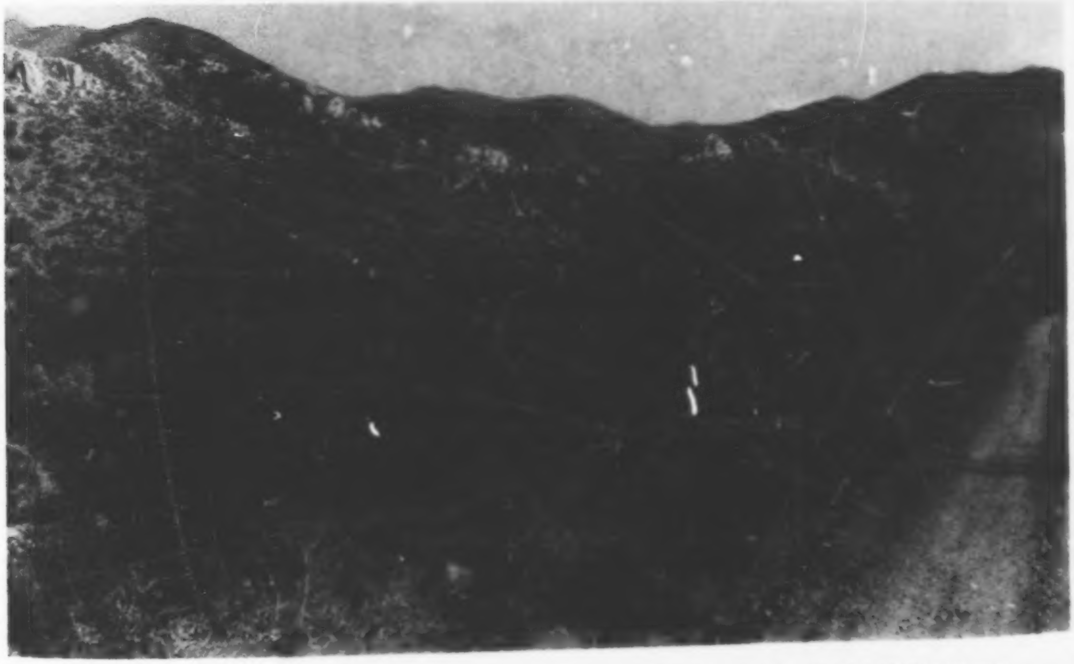


*Figure 15.*—Mokiak-Faraway-Rock outcrop complex is on hills. Santo Tomas soils are along drainageways.

*Figure 16.*—Peach orchard and cotton crop in an area of Pima-Grabe association.

*Figure 17.*—An area of nearly level Santo Tomas soils on bottom land. Mokiak-Faraway-Rock outcrop complex is on mountains in background.

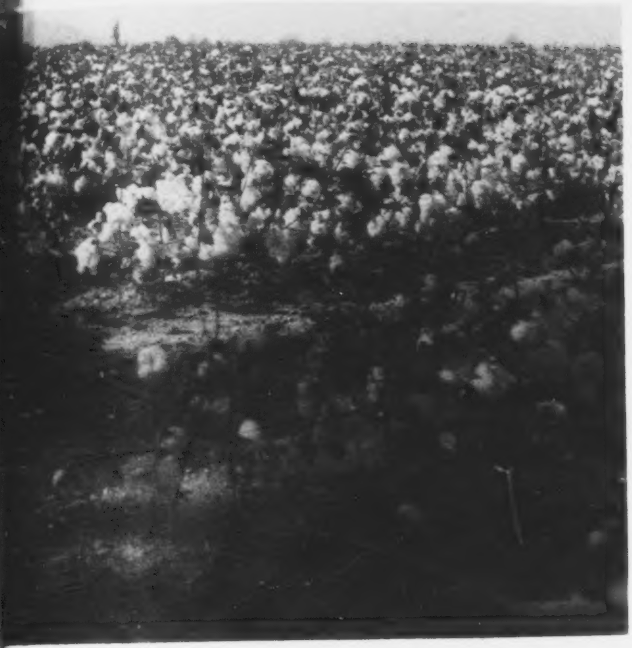


*Figure 18.*—Cotton on Sonoita fine sandy loam.

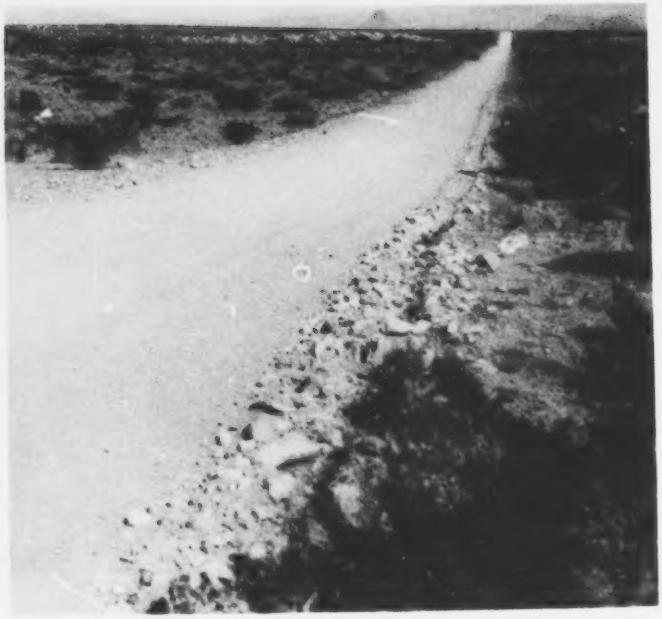


*Figure 19.*—Typical ground cover in an area of Tres Hermanos gravelly loam.

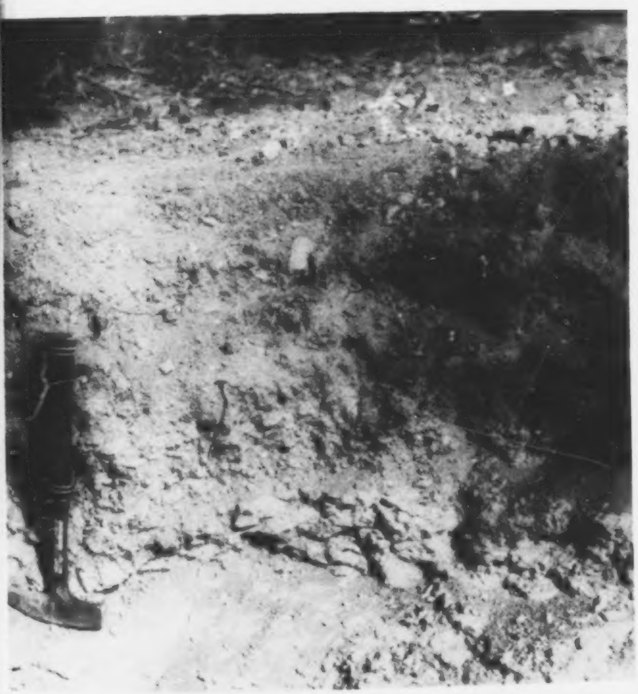


*Figure 20.*—Profile of Tres Hermanos gravelly loam.

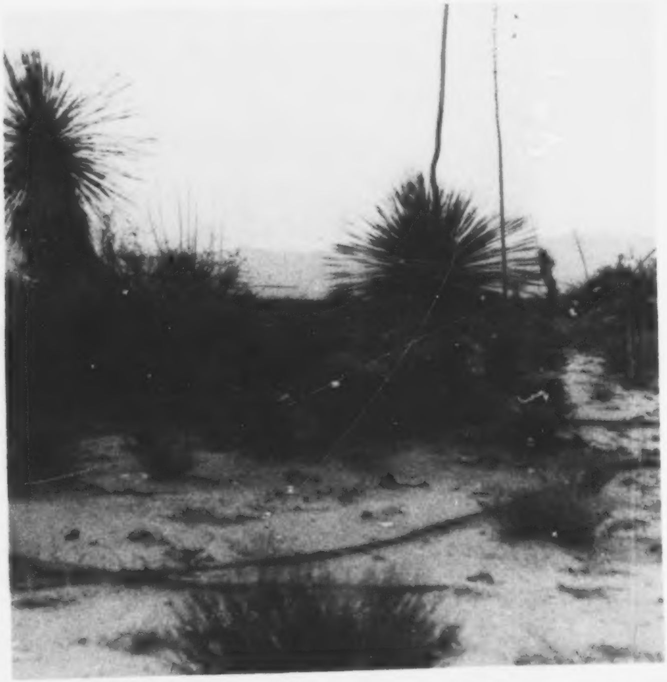


*Figure 21.*—Typical vegetation in an area of Tubac-Sonoita complex.

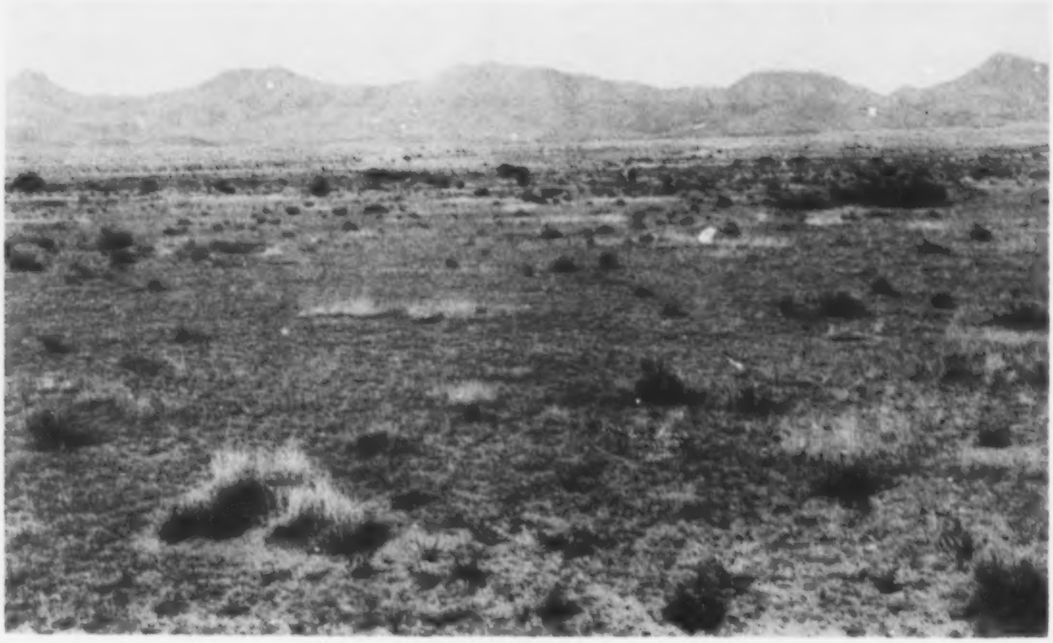


*Figure 22.*—Typical ground cover in an area of White House-Forrest association. Mokiak-Faraway-Rock outcrop complex is on hills in background.

# TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION AT SAFFORD

| Month | Temperature* | | | | | | Precipitation* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2 years in 10 will have-- | | | | 2 years in 10 will have-- | | | |
| | Average daily maximum | Average daily minimum | Average | Maximum temperature higher than-- | Minimum temperature lower than-- | Average number of growing degree days** | Average | Less than-- | More than-- | Average number of days with 0.10 inch or more | Average snowfal |
| | °F | °F | °F | °F | °F | Units | In | In | In | | In |
| January---- | 59.8 | 27.3 | 43.6 | 74 | 13 | 13 | .53 | .09 | .85 | 2 | .2 |
| February--- | 64.4 | 30.0 | 47.2 | 81 | 14 | 67 | .49 | .08 | .79 | 1 | .3 |
| March------ | 70.1 | 35.8 | 53.0 | 88 | 19 | 147 | .60 | .07 | 1.00 | 2 | .3 |
| April------ | 79.1 | 42.2 | 60.7 | 94 | 28 | 321 | .18 | .00 | .31 | 1 | .0 |
| May-------- | 88.3 | 49.8 | 69.1 | 101 | 33 | 592 | .09 | .00 | .16 | 0 | .0 |
| June------- | 97.4 | 59.5 | 78.5 | 108 | 44 | 855 | .27 | .00 | .46 | 1 | .0 |
| July------- | 98.3 | 67.3 | 82.8 | 109 | 56 | 1,017 | 1.86 | 1.13 | 2.50 | 4 | .0 |
| August----- | 95.0 | 65.4 | 80.2 | 105 | 55 | 936 | 1.76 | .70 | 2.61 | 4 | .0 |
| September-- | 91.6 | 57.7 | 74.7 | 102 | 42 | 741 | 1.02 | .07 | 1.73 | 2 | .0 |
| October---- | 82.0 | 46.2 | 64.1 | 95 | 28 | 437 | .84 | .00 | 1.42 | 2 | .0 |
| November--- | 68.7 | 34.8 | 51.8 | 84 | 20 | 111 | .38 | .05 | .63 | 1 | .1 |
| December--- | 59.7 | 28.2 | 44.0 | 75 | 13 | 12 | .77 | .15 | 1.25 | 2 | 1.0 |
| Year----- | 79.5 | 45.4 | 62.5 | 109 | 10 | 5,249 | 8.79 | 6.79 | 10.63 | 22 | 1.9 |

*Recorded in the period 1951-74 at Safford, Ariz.

**A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--TEMPERATURE AND PRECIPITATION AT WILLCOX

| Month | Temperature* | | | | | | Precipitation* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average daily maximum | Average daily minimum | Average | 2 years in 10 will have-- | | Average number of growing degree days** | Average | 2 years in 10 will have-- | | Average number of days with 0.10 inch or more | Average snowfall |
| | | | | Maximum temperature higher than-- | Minimum temperature lower than-- | | | Less than-- | More than-- | | |
| | °F | °F | °F | °F | °F | Units | In | In | In | | In |
| January---- | 59.1 | 24.4 | 41.8 | 75 | 7 | 11 | .67 | .13 | 1.09 | 2 | 1.2 |
| February--- | 63.1 | 25.6 | 44.3 | 81 | 8 | 39 | .53 | .08 | .88 | 2 | .6 |
| March------ | 68.7 | 30.4 | 49.6 | 86 | 12 | 95 | .64 | .08 | 1.07 | 2 | .7 |
| April------ | 77.2 | 35.6 | 56.4 | 92 | 21 | 213 | .26 | .00 | .46 | 1 | .1 |
| May-------- | 86.2 | 42.6 | 64.3 | 100 | 26 | 443 | .15 | .00 | .25 | 0 | .0 |
| June------- | 95.1 | 52.7 | 73.9 | 106 | 35 | 717 | .45 | .03 | .76 | 1 | .0 |
| July------- | 95.3 | 62.9 | 79.1 | 106 | 52 | 902 | 2.83 | 1.60 | 3.83 | 6 | .0 |
| August----- | 92.0 | 60.1 | 76.0 | 102 | 48 | 806 | 2.66 | 1.15 | 3.87 | 6 | .0 |
| September-- | 89.3 | 53.1 | 71.2 | 99 | 36 | 636 | 1.05 | .12 | 1.75 | 3 | .0 |
| October---- | 79.8 | 40.8 | 60.3 | 93 | 23 | 323 | .76 | .07 | 1.27 | 2 | .0 |
| November--- | 67.3 | 30.1 | 48.7 | 83 | 15 | 43 | .43 | .07 | .70 | 1 | .2 |
| December--- | 58.9 | 24.6 | 41.8 | 75 | 8 | 0 | .97 | .09 | 1.61 | 3 | 1.5 |
| Year----- | 77.7 | 40.2 | 59.0 | 107 | 5 | 4,228 | 11.40 | 8.92 | 13.71 | 29 | 4.3 |

*Recorded in the period 1951-74 at Willcox, Ariz.

**A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 3.--FREEZE DATES IN SPRING AND FALL AT SAFFORD

| Probability | Temperature* | | |
|---|---|---|---|
| | 24° F or lower | 28° F or lower | 32° F or lower |
| Last freezing temperature in spring: | | | |
| 1 year in 10 later than-- | March 23 | April 16 | May 3 |
| 2 years in 10 later than-- | March 16 | April 8 | April 27 |
| 5 years in 10 later than-- | March 3 | March 24 | April 14 |
| First freezing temperature in fall: | | | |
| 1 year in 10 earlier than-- | November 4 | November 2 | October 18 |
| 2 years in 10 earlier than-- | November 12 | November 7 | October 22 |
| 5 years in 10 earlier than-- | November 27 | November 16 | October 31 |

*Recorded in the period 1951-74 at Safford, Ariz.

TABLE 4.--FREEZE DATES IN SPRING AND FALL AT WILLCOX

| Probability | Temperature* | | |
|---|---|---|---|
| | 24° F or lower | 28° F or lower | 32° F or lower |
| Last freezing temperature in spring: | | | |
| 1 year in 10 later than-- | May 3 | May 17 | June 1 |
| 2 years in 10 later than-- | April 23 | May 9 | May 23 |
| 5 years in 10 later than-- | April 4 | April 23 | May 7 |
| First freezing temperature in fall: | | | |
| 1 year in 10 earlier than-- | October 24 | October 16 | October 4 |
| 2 years in 10 earlier than-- | October 29 | October 20 | October 9 |
| 5 years in 10 earlier than-- | November 9 | October 28 | October 20 |

*Recorded in the period 1951-74 at Wilcox, Ariz.

TABLE 5.--GROWING SEASON LENGTH AT SAFFORD

| Probability | Daily minimum temperature during growing season* | | |
|---|---|---|---|
| | Higher than 24° F | Higher than 28° F | Higher than 32° F |
| | Days | Days | Days |
| 9 years in 10 | 237 | 206 | 176 |
| 8 years in 10 | 248 | 216 | 184 |
| 5 years in 10 | 269 | 236 | 199 |
| 2 years in 10 | 290 | 256 | 214 |
| 1 year in 10 | 300 | 266 | 221 |

*Recorded in the period 1951-74 at Safford, Ariz.

TABLE 6.--GROWING SEASON LENGTH AT WILLCOX

| Probability | Daily minimum temperature during growing season* | | |
|---|---|---|---|
| | Higher than 24° F | Higher than 28° F | Higher than 32° F |
| | Days | Days | Days |
| 9 years in 10 | 180 | 156 | 131 |
| 8 years in 10 | 193 | 167 | 143 |
| 5 years in 10 | 218 | 188 | 165 |
| 2 years in 10 | 243 | 209 | 187 |
| 1 year in 10 | 256 | 219 | 199 |

*Recorded in the period 1951-74 at Wilcox, Ariz.

TABLE 7.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

| Map symbol | Soil name | Acres | Percent |
|---|---|---|---|
| 1 | Anthony-Gila complex | 28,332 | 2.3 |
| 2 | Arizo soils | 5,806 | 0.5 |
| 3 | Artesia cobbly fine sandy loam | 32,543 | 2.7 |
| 4 | Atascosa-Chiricahua-Rock outcrop complex | 72,272 | 5.9 |
| 5 | Atascosa-Graham-Rock outcrop complex | 105,873 | 8.7 |
| 6 | Bluepoint loamy sand | 15,244 | 1.2 |
| 7 | Bluepoint-Gothard complex | 24,306 | 2.0 |
| 8 | Bonita cobbly silty clay | 18,102 | 1.5 |
| 9 | Bucklebar fine sandy loam | 13,091 | 1.1 |
| 10 | Calciorthids and Torriorthents, eroded | 22,708 | 1.9 |
| 11 | Cave-Durorthids complex | 23,231 | 1.9 |
| 12 | Comoro soils | 39,723 | 3.3 |
| 13 | Continental-Tubac complex | 58,677 | 4.8 |
| 14 | Dona Ana fine sandy loam, 0 to 2 percent slopes | 8,266 | 0.7 |
| 15 | Dona Ana fine sandy loam, 0 to 5 percent slopes | 14,866 | 1.2 |
| 16 | Eba gravelly sandy loam | 46,213 | 3.8 |
| 17 | Eba gravelly fine sandy loam | 4,240 | 0.3 |
| 18 | Faraway-Rock outcrop complex | 15,140 | 1.2 |
| 19 | Forrest-White House-Kimbrough complex | 8,038 | 0.7 |
| 20 | Gila loam | 14,190 | 1.2 |
| 21 | Gila-Anthony-Bluepoint complex | 6,721 | 0.6 |
| 22 | Glendale-Gila complex | 2,878 | 0.2 |
| 23 | Glendale-Gila complex, eroded | 29,655 | 2.4 |
| 24 | Glendale-Gila association, frequently flooded | 6,491 | 0.5 |
| 25 | Graham-Rock outcrop complex | 66,202 | 5.4 |
| 26 | Guest silty clay loam | 6,135 | 0.5 |
| 27 | Guest and Hantz soils | 16,599 | 1.4 |
| 28 | Hondale silty clay loam | 12,068 | 1.0 |
| 29 | Hondale complex | 29,694 | 2.4 |
| 30 | Kimbrough gravelly fine sandy loam | 9,704 | 0.8 |
| 31 | Mabray-Rock outcrop complex | 12,534 | 1.0 |
| 32 | Mokiak-Faraway-Rock outcrop complex | 28,455 | 2.3 |
| 33 | Pima-Grabe silt loams | 19,873 | 1.6 |
| 34 | Pima-Grabe association | 49,705 | 4.1 |
| 35 | Pridham silty clay loam | 861 | 0.1 |
| 36 | Santo Tomas soils | 20,480 | 1.7 |
| 37 | Signal gravelly loam | 29,760 | 2.4 |
| 38 | Sonoita gravelly sandy loam | 50,829 | 4.2 |
| 39 | Sonoita fine sandy loam | 4,619 | 0.4 |
| 40 | Tres Hermanos gravelly loam | 115,337 | 9.3 |
| 41 | Tubac sandy clay loam, 0 to 2 percent slopes | 8,022 | 0.7 |
| 42 | Tubac soils, 0 to 5 percent slopes | 49,344 | 4.0 |
| 43 | Tubac-Sonoita complex | 27,788 | 2.3 |
| 44 | Vekol loam | 7,522 | 0.6 |
| 45 | White House-Forrest association | 38,859 | 3.2 |
|  | Total | 1,220,996 | 100.0 |

TABLE 8.--YIELDS PER ACRE OF IRRIGATED CROPS

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

| Soil name and map symbol | Cotton lint | Alfalfa hay | Wheat | Grain sorghum | Barley |
|---|---|---|---|---|---|
| | Lb | Ton | Bu | Bu | Bu |
| 1<br>Anthony-Gila | --- | --- | --- | --- | --- |
| 2<br>Arizo, Arizo and Arizo | --- | --- | --- | --- | --- |
| 3<br>Artesia | --- | --- | --- | --- | --- |
| 4<br>Atascosa-Chiricahua-Rock outcrop | --- | --- | --- | --- | --- |
| 5<br>Atascosa-Graham-Rock outcrop | --- | --- | --- | --- | --- |
| 6*<br>Bluepoint | --- | --- | --- | --- | --- |
| 7*<br>Bluepoint-Gothard | --- | --- | --- | --- | --- |
| 8<br>Bonita | --- | --- | --- | --- | --- |
| 9<br>Bucklebar | 1,100 | 8 | 80 | 120 | 105 |
| 10<br>Calciorthids and Torriorthents | --- | --- | --- | --- | --- |
| 11<br>Cave-Durorthids | --- | --- | --- | --- | --- |
| 12<br>Comoro, Comoro and Comoro | 837 | 7 | 58 | 101 | 68 |
| 13<br>Continental-Tubac | --- | --- | --- | --- | --- |
| 14<br>Dona Ana | 1,300 | 8 | --- | 115 | 110 |
| 15<br>Dona Ana | --- | --- | --- | --- | --- |
| 16<br>Eba | --- | --- | --- | --- | --- |
| 17<br>Eba | --- | 6 | --- | --- | --- |
| 18<br>Faraway-Rock outcrop | --- | --- | --- | --- | --- |
| 19<br>Forrest-White House-Kimbrough | --- | --- | --- | --- | --- |
| 20<br>Gila | --- | --- | --- | --- | --- |

See footnotes at end of table.

TABLE 8.--YIELDS PER ACRE OF IRRIGATED CROPS--Continued

| Soil name and map symbol | Cotton lint | Alfalfa hay | Wheat | Grain sorghum | Barley |
|---|---|---|---|---|---|
| | Lb | Ton | Bu | Bu | Bu |
| 21* Gila-Anthony-Bluepoint | --- | --- | --- | --- | --- |
| 22 Glendale-Gila | 1,300 | 9 | 80 | 115 | 110 |
| 23, 24**: | | | | | |
| Glendale | --- | --- | --- | --- | --- |
| Gila | --- | --- | --- | --- | --- |
| 25 Graham-Rock outcrop | --- | --- | --- | --- | --- |
| 26 Guest | 900 | 6.5 | 95 | 105 | 100 |
| 27 Guest and Hantz | --- | --- | --- | --- | 77 |
| 28 Hondale | 750 | 6 | 55 | 80 | 60 |
| 29 Hondale-Hondale-Hondale | --- | --- | --- | --- | --- |
| 30 Kimbrough | --- | --- | --- | --- | --- |
| 31 Mabray-Rock outcrop | --- | --- | --- | --- | --- |
| 32 Mokiak-Faraway-Rock outcrop | --- | --- | --- | --- | --- |
| 33 Pima-Grabe | 1,190 | 8 | 67 | 125 | 110 |
| 34**: | | | | | |
| Pima | --- | --- | --- | --- | --- |
| Grabe | --- | --- | --- | --- | --- |
| 35 Pridham | --- | --- | --- | --- | --- |
| 36 Santo Tomas and Santo Tomas | --- | --- | --- | --- | --- |
| 37 Signal | --- | --- | --- | --- | --- |
| 38 Sonoita | --- | --- | --- | --- | --- |
| 39 Sonoita | 1,000 | 8 | 80 | 120 | 95 |
| 40 Tres Hermanos | --- | --- | --- | --- | --- |
| 41 Tubac | 1,100 | 8.0 | 100 | 135 | 100 |
| 42 Tubac and Tubac | --- | --- | --- | --- | --- |

See footnotes at end of table.

TABLE 8.--YIELDS PER ACRE OF IRRIGATED CROPS--Continued

| Soil name and map symbol | Cotton lint | Alfalfa hay | Wheat | Grain sorghum | Barley |
|---|---|---|---|---|---|
| | Lb | Ton | Bu | Bu | Bu |
| 43<br>Tubac-Sonoita | --- | --- | --- | --- | --- |
| 44<br>Vekol | 1,100 | 8 | 75 | 100 | 80 |
| 45**: | | | | | |
| White House | --- | --- | --- | --- | --- |
| Forrest | --- | --- | --- | --- | --- |

---

* Yields are for areas protected from flooding.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 1*: | | | | | |
| Anthony | Sand Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Alkali sacaton | 50 |
| | | Normal | 2,000 | Plains bristlegrass | 10 |
| | | Unfavorable | 300 | Vine-mesquite | 10 |
| | | | | Sideoats grama | 10 |
| | | | | Twoflower trichloris | 5 |
| | | | | Black grama | 5 |
| | | | | Bush muhly | 5 |
| Gila | Loam Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Giant sacaton | 30 |
| | | Normal | 2,000 | Sideoats grama | 10 |
| | | Unfavorable | 1,000 | Tobosa | 10 |
| | | | | Vine-mesquite | 10 |
| | | | | Cane bluestem | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Alkali sacaton | 5 |
| | | | | Bottlebrush squirreltail | 5 |
| | | | | Bush muhly | 5 |
| | | | | Black grama | 5 |
| | | | | Plains lovegrass | 5 |
| 2*: | | | | | |
| Arizo | Sand Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Giant sacaton | 20 |
| | | Normal | 2,000 | Sideoats grama | 15 |
| | | Unfavorable | 300 | Arizona cottontop | 10 |
| | | | | Apacheplume | 7 |
| | | | | Green sprangletop | 5 |
| | | | | Vine-mesquite | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Plains lovegrass | 5 |
| | | | | Bottlebrush squirreltail | 5 |
| 3 | Clay Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Tobosa | 25 |
| Artesia | | Normal | 500 | Arizona cottontop | 15 |
| | | Unfavorable | 300 | Black grama | 10 |
| | | | | Bush muhly | 10 |
| | | | | Sideoats grama | 10 |
| | | | | Vine-mesquite | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Cane bluestem | 5 |
| | | | | Fourwing saltbush | 5 |
| 4*: | | | | | |
| Atascosa | Granitic Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,500 | Sideoats grama | 20 |
| | | Normal | 1,000 | Plains lovegrass | 10 |
| | | Unfavorable | 600 | Cane bluestem | 10 |
| | | | | Black grama | 10 |
| | | | | Hairy grama | 10 |
| | | | | Threeawn | 5 |
| | | | | Slender grama | 5 |
| | | | | Bullgrass | 5 |
| | | | | Arizona cottontop | 5 |
| | | | | False-mesquite | 5 |
| | | | | Skunkbush sumac | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Wooly bunchgrass | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production |  | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
|  |  | Kind of year | Dry weight |  |  |
|  |  |  | Lb/acre |  | Pct |
| 4*: |  |  |  |  |  |
| Chiricahua | Granitic Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,250 | Sideoats grama | 20 |
|  |  | Normal | 900 | Hairy grama | 10 |
|  |  | Unfavorable | 600 | Black grama | 10 |
|  |  |  |  | Cane bluestem | 10 |
|  |  |  |  | Plains lovegrass | 10 |
|  |  |  |  | Slender grama | 5 |
|  |  |  |  | Threeawn | 5 |
|  |  |  |  | Bullgrass | 5 |
|  |  |  |  | Plains bristlegrass | 5 |
|  |  |  |  | Wooly bunchgrass | 5 |
|  |  |  |  | Arizona cottontop | 5 |
|  |  |  |  | False-mesquite | 5 |
|  |  |  |  | Skunkbush sumac | 5 |
| Rock outcrop. |  |  |  |  |  |
| 5*: |  |  |  |  |  |
| Atascosa | Volcanic Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,250 | Plains lovegrass | 25 |
|  |  | Normal | 900 | Sideoats grama | 25 |
|  |  | Unfavorable | 650 | Cane bluestem | 15 |
|  |  |  |  | Black grama | 10 |
|  |  |  |  | Tanglehead | 10 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Threeawn | 5 |
|  |  |  |  | Bush muhly | 5 |
| Graham | Basalt Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Black grama | 30 |
|  |  | Normal | 800 | Sideoats grama | 20 |
|  |  | Unfavorable | 500 | Cane bluestem | 10 |
|  |  |  |  | Arizona cottontop | 5 |
|  |  |  |  | Curlymesquite | 5 |
|  |  |  |  | Threeawn | 5 |
|  |  |  |  | Tanglehead | 5 |
|  |  |  |  | Green sprangletop | 5 |
|  |  |  |  | False-mesquite | 5 |
|  |  |  |  | Yerba-de-pasmo | 5 |
| Rock outcrop. |  |  |  |  |  |
| 6 | Deep Sand, 7- to 12-inch Precipitation Zone. | Favorable | 500 | Spike dropseed | 15 |
| Bluepoint |  | Normal | 400 | Mesa dropseed | 15 |
|  |  | Unfavorable | 300 | Bush muhly | 10 |
|  |  |  |  | Fourwing saltbush | 10 |
|  |  |  |  | Black grama | 5 |
|  |  |  |  | Giant dropseed | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| 7*: |  |  |  |  |  |
| Bluepoint | Deep Sand, 7- to 12-inch Precipitation Zone. | Favorable | 500 | Spike dropseed | 15 |
|  |  | Normal | 400 | Mesa dropseed | 15 |
|  |  | Unfavorable | 300 | Bush muhly | 10 |
|  |  |  |  | Fourwing saltbush | 10 |
|  |  |  |  | Black grama | 5 |
|  |  |  |  | Giant dropseed | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| Gothard | Saline, 7- to 12-inch Precipitation Zone. | Favorable | 1,050 | Alkali sacaton | 30 |
|  |  | Normal | 800 | Inland saltgrass | 15 |
|  |  | Unfavorable | 350 | Tobosa | 10 |
|  |  |  |  | Giant sacaton | 10 |
|  |  |  |  | Fourwing saltbush | 5 |
|  |  |  |  | Mound saltbush | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 8<br>Bonita | Clay Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,300 | Tobosa | 40 |
| | | Normal | 1,000 | Sideoats grama | 20 |
| | | Unfavorable | 800 | Vine-mesquite | 15 |
| | | | | Cane bluestem | 10 |
| | | | | Plains bristlegrass | 10 |
| | | | | Rothrock grama | 5 |
| 9<br>Bucklebar | Sandy Loam Upland, 12- to 16-inch Precipitation Zone. | Favorable | 650 | Black grama | 25 |
| | | Normal | 400 | Bush muhly | 25 |
| | | Unfavorable | 300 | Plains bristlegrass | 5 |
| | | | | Hairy grama | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Arizona cottontop | 5 |
| | | | | Cane bluestem | 5 |
| | | | | Twoflower trichloris | 5 |
| | | | | Threeawn | 5 |
| | | | | Sand dropseed | 5 |
| | | | | Rothrock grama | 5 |
| 11*:<br>Cave | Limy Upland, 12- to 16-inch Precipitation Zone. | Favorable | 400 | Bush muhly | 30 |
| | | Normal | 250 | Creosotebush | 30 |
| | | Unfavorable | 100 | Black grama | 10 |
| | | | | Slim tridens | 10 |
| | | | | Whitethorn | 10 |
| | | | | Desert zinnia | 5 |
| Durorthids. | | | | | |
| 12*:<br>Comoro | Sandy Loam Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
| | | Normal | 700 | Black grama | 20 |
| | | Unfavorable | 500 | Plains bristlegrass | 10 |
| | | | | Hairy grama | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Arizona cottontop | 5 |
| Comoro | Sandy Loam Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
| | | Normal | 700 | Black grama | 20 |
| | | Unfavorable | 500 | Plains bristlegrass | 10 |
| | | | | Hairy grama | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Arizona cottontop | 5 |
| Comoro | Sandy Loam Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
| | | Normal | 700 | Black grama | 20 |
| | | Unfavorable | 500 | Plains bristlegrass | 10 |
| | | | | Hairy grama | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Arizona cottontop | 5 |
| 13*:<br>Continental | Loamy Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Black grama | 20 |
| | | Normal | 800 | Bush muhly | 20 |
| | | Unfavorable | 550 | Tobosa | 20 |
| | | | | Sideoats grama | 15 |
| | | | | Blue grama | 10 |
| | | | | Plains bristlegrass | 5 |
| | | | | Arizona cottontop | 5 |
| Tubac | Loamy Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Black grama | 20 |
| | | Normal | 800 | Bush muhly | 20 |
| | | Unfavorable | 550 | Tobosa | 20 |
| | | | | Sideoats grama | 15 |
| | | | | Blue grama | 10 |
| | | | | Plains bristlegrass | 5 |
| | | | | Arizona cottontop | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 14, 15<br>Dona Ana | Sandy Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 600 | Black grama | 25 |
| | | Normal | 400 | Bush muhly | 25 |
| | | Unfavorable | 300 | Creosotebush | 10 |
| | | | | Plains bristlegrass | 10 |
| | | | | Sand dropseed | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Arizona cottontop | 5 |
| 16, 17<br>Eba | Clay Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Tobosa | 25 |
| | | Normal | 700 | Arizona cottontop | 15 |
| | | Unfavorable | 300 | Bush muhly | 10 |
| | | | | Sideoats grama | 10 |
| | | | | Vine-mesquite | 5 |
| | | | | Cane bluestem | 5 |
| | | | | Fourwing saltbush | 5 |
| | | | | American tarbush | 5 |
| | | | | Broom snakeweed | 5 |
| | | | | False-mesquite | 5 |
| 18*: | | | | | |
| Faraway | Volcanic Hills, 16- to 20-inch Precipitation Zone. | Favorable | 1,500 | Plains lovegrass | 30 |
| | | Normal | 1,100 | Sideoats grama | 20 |
| | | Unfavorable | 600 | Crinkleawn | 15 |
| | | | | Wooly bunchgrass | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Cane bluestem | 5 |
| | | | | Tanglehead | 5 |
| | | | | Texas bluestem | 5 |
| Rock outcrop. | | | | | |
| 19*: | | | | | |
| Forrest | Loamy Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,200 | Sideoats grama | 20 |
| | | Normal | 800 | Blue grama | 15 |
| | | Unfavorable | 500 | Black grama | 10 |
| | | | | Cane bluestem | 10 |
| | | | | Plains lovegrass | 10 |
| | | | | Arizona cottontop | 6 |
| | | | | Vine-mesquite | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Shrubby buckwheat | 5 |
| | | | | False-mesquite | 5 |
| White House | Loamy Upland, 12- to 16-inch Precipitation Zone. | Favorable | 1,300 | Sideoats grama | 20 |
| | | Normal | 1,000 | Blue grama | 15 |
| | | Unfavorable | 600 | Black grama | 10 |
| | | | | Cane bluestem | 10 |
| | | | | Plains lovegrass | 10 |
| | | | | Arizona cottontop | 6 |
| | | | | Vine-mesquite | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Shrubby buckwheat | 5 |
| | | | | False-mesquite | 5 |
| Kimbrough | Limy Slopes, 12- to 16-inch Precipitation Zone. | Favorable | 1,200 | Black grama | 20 |
| | | Normal | 800 | Sideoats grama | 20 |
| | | Unfavorable | 500 | Threeawn | 10 |
| | | | | Tridens | 10 |
| | | | | Hairy grama | 10 |
| | | | | Cane bluestem | 10 |
| | | | | Fluffgrass | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 20<br>Gila | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 800 | Bush muhly | 40 |
| | | Normal | 700 | Giant sacaton | 10 |
| | | Unfavorable | 500 | Alkali sacaton | 10 |
| | | | | Tobosa | 10 |
| | | | | Arizona cottontop | 10 |
| | | | | Creosotebush | 10 |
| | | | | Soaptree yucca | 5 |
| | | | | Crucifixion-thorn | 5 |
| 21*: | | | | | |
| Gila | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 800 | Bush muhly | 40 |
| | | Normal | 700 | Giant sacaton | 10 |
| | | Unfavorable | 500 | Alkali sacaton | 10 |
| | | | | Tobosa | 10 |
| | | | | Arizona cottontop | 10 |
| | | | | Creosotebush | 10 |
| | | | | Soaptree yucca | 5 |
| | | | | Crucifixion-thorn | 5 |
| Anthony | Sandy Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 650 | Bush muhly | 40 |
| | | Normal | 500 | Black grama | 20 |
| | | Unfavorable | 450 | Plains bristlegrass | 10 |
| | | | | Arizona cottontop | 5 |
| | | | | Threeawn | 5 |
| | | | | Hairy grama | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Spike dropseed | 5 |
| Bluepoint | Deep Sand, 7- to 12-inch Precipitation Zone. | Favorable | 500 | Spike dropseed | 15 |
| | | Normal | 400 | Mesa dropseed | 15 |
| | | Unfavorable | 300 | Bush muhly | 10 |
| | | | | Fourwing saltbush | 10 |
| | | | | Black grama | 5 |
| | | | | Giant dropseed | 5 |
| | | | | Arizona cottontop | 5 |
| 22*: | | | | | |
| Glendale | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 800 | Bush muhly | 40 |
| | | Normal | 700 | Giant sacaton | 10 |
| | | Unfavorable | 500 | Alkali sacaton | 10 |
| | | | | Tobosa | 10 |
| | | | | Arizona cottontop | 10 |
| | | | | Creosotebush | 10 |
| | | | | Soaptree yucca | 5 |
| | | | | Crucifixion-thorn | 5 |
| Gila | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 800 | Bush muhly | 40 |
| | | Normal | 700 | Giant sacaton | 10 |
| | | Unfavorable | 500 | Alkali sacaton | 10 |
| | | | | Tobosa | 10 |
| | | | | Arizona cottontop | 10 |
| | | | | Creosotebush | 10 |
| | | | | Soaptree yucca | 5 |
| | | | | Crucifixion-thorn | 5 |
| 23*: | | | | | |
| Glendale | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 800 | Bush muhly | 40 |
| | | Normal | 700 | Giant sacaton | 10 |
| | | Unfavorable | 500 | Alkali sacaton | 10 |
| | | | | Tobosa | 10 |
| | | | | Arizona cottontop | 10 |
| | | | | Creosotebush | 10 |
| | | | | Soaptree yucca | 5 |
| | | | | Crucifixion-thorn | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 23*: | | | | | |
| Gila | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 800 | Bush muhly | 40 |
| | | Normal | 700 | Giant sacaton | 10 |
| | | Unfavorable | 500 | Alkali sacaton | 10 |
| | | | | Tobosa | 10 |
| | | | | Arizona cottontop | 10 |
| | | | | Creosotebush | 10 |
| | | | | Soaptree yucca | 5 |
| | | | | Crucifixion-thorn | 5 |
| 24*: | | | | | |
| Glendale | Loam Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Giant sacaton | 30 |
| | | Normal | 2,000 | Sideoats grama | 10 |
| | | Unfavorable | 1,000 | Tobosa | 10 |
| | | | | Vine-mesquite | 10 |
| | | | | Cane bluestem | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Alkali sacaton | 5 |
| | | | | Bottlebrush squirreltail | 5 |
| | | | | Bush muhly | 5 |
| | | | | Black grama | 5 |
| | | | | Plains lovegrass | 5 |
| Gila | Loam Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Giant sacaton | 30 |
| | | Normal | 2,000 | Sideoats grama | 10 |
| | | Unfavorable | 1,000 | Tobosa | 10 |
| | | | | Vine-mesquite | 10 |
| | | | | Cane bluestem | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Alkali sacaton | 5 |
| | | | | Bottlebrush squirreltail | 5 |
| | | | | Bush muhly | 5 |
| | | | | Black grama | 5 |
| | | | | Plains lovegrass | 5 |
| 25*: | | | | | |
| Graham | Basalt Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,000 | Black grama | 30 |
| | | Normal | 800 | Sideoats grama | 20 |
| | | Unfavorable | 500 | Cane bluestem | 10 |
| | | | | Arizona cottontop | 5 |
| | | | | Curlymesquite | 5 |
| | | | | Threeawn | 5 |
| | | | | Tanglehead | 5 |
| | | | | Green sprangletop | 5 |
| | | | | False-mesquite | 5 |
| | | | | Yerba-de-pasmo | 5 |
| Rock outcrop. | | | | | |
| 26 Guest | Clay Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Tobosa | 50 |
| | | Normal | 600 | Vine-mesquite | 25 |
| | | Unfavorable | 100 | Cane bluestem | 5 |
| | | | | Twoflower trichloris | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Sideoats grama | 5 |
| 27*: | | | | | |
| Guest | Clay Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Tobosa | 50 |
| | | Normal | 600 | Vine-mesquite | 25 |
| | | Unfavorable | 100 | Cane bluestem | 5 |
| | | | | Twoflower trichloris | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Sideoats grama | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 27*: | | | | | |
| Hantz | Clay Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Tobosa | 50 |
| | | Normal | 600 | Vine-mesquite | 25 |
| | | Unfavorable | 100 | Cane bluestem | 5 |
| | | | | Twoflower trichloris | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Sideoats grama | 5 |
| 28 Hondale | Saline, 7- to 12-inch Precipitation Zone. | Favorable | 1,050 | Alkali sacaton | 30 |
| | | Normal | 800 | Inland saltgrass | 15 |
| | | Unfavorable | 350 | Tobosa | 10 |
| | | | | Giant sacaton | 10 |
| | | | | Fourwing saltbush | 5 |
| 29*: | | | | | |
| Hondale | Saline, 7- to 12-inch Precipitation Zone. | Favorable | 1,050 | Alkali sacaton | 30 |
| | | Normal | 800 | Inland saltgrass | 15 |
| | | Unfavorable | 350 | Tobosa | 10 |
| | | | | Giant sacaton | 10 |
| | | | | Fourwing saltbush | 5 |
| 30 Kimbrough | Limy Slopes, 12- to 16-inch Precipitation Zone. | Favorable | 1,200 | Black grama | 20 |
| | | Normal | 800 | Sideoats grama | 20 |
| | | Unfavorable | 500 | Threeawn | 10 |
| | | | | Tridens | 10 |
| | | | | Hairy grama | 10 |
| | | | | Cane bluestem | 10 |
| | | | | Fluffgrass | 5 |
| 31*: | | | | | |
| Mabray | Limestone Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,600 | Sideoats grama | 20 |
| | | Normal | 900 | Black grama | 10 |
| | | Unfavorable | 300 | Cane bluestem | 10 |
| | | | | Slim tridens | 10 |
| | | | | Plains bristlegrass | 10 |
| | | | | Threeawn | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Bush muhly | 5 |
| | | | | Arizona cottontop | 5 |
| | | | | Ratany | 5 |
| | | | | Mariola | 5 |
| | | | | Sacahuista | 5 |
| | | | | Ocotillo | 5 |
| Rock outcrop. | | | | | |
| 32*: | | | | | |
| Mokiak | Granitic Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,500 | Sideoats grama | 20 |
| | | Normal | 1,000 | Black grama | 10 |
| | | Unfavorable | 600 | Threeawn | 5 |
| Faraway | Volcanic Hills, 12- to 16-inch Precipitation Zone. | Favorable | 1,500 | Plains lovegrass | 30 |
| | | Normal | 1,100 | Sideoats grama | 20 |
| | | Unfavorable | 600 | Crinkleawn | 15 |
| | | | | Wooly bunchgrass | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Cane bluestem | 5 |
| | | | | Tanglehead | 5 |
| | | | | Texas bluestem | 5 |
| Rock outcrop. | | | | | |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 33*: | | | | | |
| Pima | Loam Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
| | | Normal | 750 | Black grama | 20 |
| | | Unfavorable | 550 | Plains bristlegrass | 10 |
| | | | | Sideoats grama | 5 |
| | | | | Hairy grama | 5 |
| | | | | Arizona cottontop | 5 |
| Grabe | Sandy Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 650 | Bush muhly | 40 |
| | | Normal | 500 | Black grama | 20 |
| | | Unfavorable | 450 | Plains bristlegrass | 10 |
| | | | | Sideoats grama | 5 |
| | | | | Hairy grama | 5 |
| | | | | Arizona cottontop | 5 |
| 34*: | | | | | |
| Pima | Loam Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Giant sacaton | 30 |
| | | Normal | 2,000 | Sideoats grama | 10 |
| | | Unfavorable | 1,000 | Tobosa | 10 |
| | | | | Vine-mesquite | 10 |
| | | | | Cane bluestem | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Alkali sacaton | 5 |
| | | | | Bottlebrush squirreltail | 5 |
| | | | | Bush muhly | 5 |
| | | | | Black grama | 5 |
| | | | | Plains lovegrass | 5 |
| Grabe | Loam Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Giant sacaton | 30 |
| | | Normal | 2,000 | Sideoats grama | 10 |
| | | Unfavorable | 1,000 | Tobosa | 10 |
| | | | | Vine-mesquite | 10 |
| | | | | Cane bluestem | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Alkali sacaton | 5 |
| | | | | Bottlebrush squirreltail | 5 |
| | | | | Bush muhly | 5 |
| | | | | Black grama | 5 |
| | | | | Plains lovegrass | 5 |
| 35<br>Pridham | Seepland, 12- to 16-inch Precipitation Zone. | Favorable | 1,500 | Alkali sacaton | 25 |
| | | Normal | 1,000 | Tobosa | 10 |
| | | Unfavorable | 700 | Bush muhly | 10 |
| | | | | Vine-mesquite | 10 |
| | | | | Giant sacaton | 5 |
| | | | | Inland saltgrass | 5 |
| | | | | Black grama | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Sideoats grama | 5 |
| | | | | Blue grama | 5 |
| | | | | Torrey seapweed | 5 |
| 36*: | | | | | |
| Santo Tomas | Sand Bottom, 7- to 12-inch Precipitation Zone. | Favorable | 3,000 | Sideoats grama | 15 |
| | | Normal | 1,800 | Arizona cottontop | 10 |
| | | Unfavorable | 300 | Giant sacaton | 10 |
| | | | | Bottlebrush squirreltail | 10 |
| | | | | Vine-mesquite | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Plains lovegrass | 5 |
| | | | | Cane bluestem | 5 |
| | | | | Bush muhly | 5 |
| | | | | Green sprangletop | 5 |
| | | | | Threeawn | 5 |
| Santo Tomas. | | | | | |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production |  | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
|  |  | Kind of year | Dry weight |  |  |
|  |  |  | Lb/acre |  | Pct |
| 37: Signal | Clay Hills, 12- to 16-inch Precipitation Zone. | Favorable | 2,350 | Sideoats grama | 30 |
|  |  | Normal | 1,200 | Black grama | 10 |
|  |  | Unfavorable | 800 | Tobosa | 10 |
|  |  |  |  | Cane bluestem | 10 |
|  |  |  |  | Vine-mesquite | 5 |
|  |  |  |  | Curlymesquite | 5 |
|  |  |  |  | Green sprangletop | 5 |
|  |  |  |  | Bush muhly | 5 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Plains bristlegrass | 5 |
| 38, 39: Sonoita | Sandy Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
|  |  | Normal | 800 | Black grama | 20 |
|  |  | Unfavorable | 550 | Plains bristlegrass | 10 |
|  |  |  |  | Sideoats grama | 5 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| 40: Tres Hermanos | Limy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 400 | Bush muhly | 30 |
|  |  | Normal | 250 | Creosotebush | 30 |
|  |  | Unfavorable | 100 | Black grama | 10 |
|  |  |  |  | Slim tridens | 10 |
|  |  |  |  | Mescat acacia | 10 |
|  |  |  |  | Desert zinnia | 5 |
| 41: Tubac | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
|  |  | Normal | 750 | Black grama | 20 |
|  |  | Unfavorable | 500 | Plains bristlegrass | 10 |
|  |  |  |  | Sideoats grama | 5 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| 42*: |  |  |  |  |  |
| Tubac | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
|  |  | Normal | 750 | Black grama | 20 |
|  |  | Unfavorable | 500 | Plains bristlegrass | 10 |
|  |  |  |  | Sideoats grama | 5 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| 43*: |  |  |  |  |  |
| Tubac | Sandy Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
|  |  | Normal | 750 | Black grama | 20 |
|  |  | Unfavorable | 500 | Plains bristlegrass | 10 |
|  |  |  |  | Sideoats grama | 5 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| Sonoita | Sandy Loam Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Bush muhly | 40 |
|  |  | Normal | 800 | Black grama | 20 |
|  |  | Unfavorable | 550 | Plains bristlegrass | 10 |
|  |  |  |  | Sideoats grama | 5 |
|  |  |  |  | Hairy grama | 5 |
|  |  |  |  | Arizona cottontop | 5 |
| 44: Vekol | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,000 | Black grama | 20 |
|  |  | Normal | 800 | Bush muhly | 20 |
|  |  | Unfavorable | 500 | Tobosa | 20 |
|  |  |  |  | Sideoats grama | 15 |
|  |  |  |  | Blue grama | 10 |
|  |  |  |  | Plains bristlegrass | 5 |
|  |  |  |  | Arizona cottontop | 5 |
|  |  |  |  | False-mesquite | 5 |

See footnote at end of table.

TABLE 9.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

| Soil name and map symbol | Range site | Total production | | Characteristic vegetation | Composition |
|---|---|---|---|---|---|
| | | Kind of year | Dry weight | | |
| | | | Lb/acre | | Pct |
| 45*: | | | | | |
| White House | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,300 | Sideoats grama | 20 |
| | | Normal | 1,000 | Blue grama | 15 |
| | | Unfavorable | 600 | Black grama | 10 |
| | | | | Cane bluestem | 10 |
| | | | | Plains lovegrass | 10 |
| | | | | Arizona cottontop | 6 |
| | | | | Vine-mesquite | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Shrubby buckwheat | 5 |
| | | | | False-mesquite | 5 |
| Forrest | Loamy Upland, 7- to 12-inch Precipitation Zone. | Favorable | 1,200 | Sideoats grama | 20 |
| | | Normal | 800 | Blue grama | 15 |
| | | Unfavorable | 500 | Black grama | 10 |
| | | | | Cane bluestem | 10 |
| | | | | Plains lovegrass | 10 |
| | | | | Arizona cottontop | 6 |
| | | | | Vine-mesquite | 5 |
| | | | | Plains bristlegrass | 5 |
| | | | | Shrubby buckwheat | 5 |
| | | | | False-mesquite | 5 |

* See description of the map unit for composition and behavior characteristics of the map unit.

## TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| 1*: | | | | | |
| Anthony | Moderate: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Gila | Moderate: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| 2*: | | | | | |
| Arizo (Fine sandy loam) | Severe: cutbanks cave. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Arizo (Gravelly sandy loam) | Severe: cutbanks cave. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Arizo (Gravelly loamy sand) | Severe: cutbanks cave. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| 3 Artesia | Severe: cemented pan. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell. |
| 4*: | | | | | |
| Atascosa | Severe: depth to rock, slope. | Severe: slope. | Severe: depth to rock, slope. | Severe: slope. | Severe: slope. |
| Chiricahua | Severe: depth to rock, slope. | Severe: shrink-swell, slope, low strength. | Severe: depth to rock, slope, shrink-swell. | Severe: slope, low strength, shrink-swell. | Severe: slope, shrink-swell, low strength. |
| Rock outcrop. | | | | | |
| 5*: | | | | | |
| Atascosa | Severe: depth to rock, slope. | Severe: slope. | Severe: depth to rock, slope. | Severe: slope. | Severe: slope. |
| Graham | Severe: depth to rock, slope. | Severe: depth to rock, shrink-swell, slope. | Severe: depth to rock, shrink-swell, slope. | Severe: depth to rock, shrink-swell, slope. | Severe: depth to rock, shrink-swell, slope. |
| Rock outcrop. | | | | | |
| 6 Bluepoint | Severe: cutbanks cave. | Slight | Slight | Moderate: slope. | Slight. |
| 7*: | | | | | |
| Bluepoint | Severe: cutbanks cave. | Slight | Slight | Moderate: slope. | Slight. |
| Gothard | Slight | Moderate: shrink-swell, low strength. | Moderate: shrink-swell, low strength. | Moderate: low strength, shrink-swell. | Moderate: low strength, shrink-swell. |
| 8 Bonita | Moderate: too clayey. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. |
| 9 Bucklebar | Slight | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell, low strength. |

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| 10*: | | | | | |
| Calciorthids. | | | | | |
| Torriorthents. | | | | | |
| 11*: | | | | | |
| Cave | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. |
| Durorthids. | | | | | |
| 12*: | | | | | |
| Comoro (Fine sandy loam) | Slight | Severe: floods. | Severe: floods. | Severe: floods. | Moderate: floods. |
| Comoro (Gravelly sandy loam) | Slight | Severe: floods. | Severe: floods. | Severe: floods. | Moderate: floods. |
| Comoro (Sandy loam) | Slight | Severe: floods. | Severe: floods. | Severe: floods. | Moderate: floods. |
| 13*: | | | | | |
| Continental | Moderate: too clayey. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: slope, shrink-swell. | Severe: shrink-swell, low strength. |
| Tubac | Moderate: too clayey. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: low strength, shrink-swell. |
| 14, 15<br>Dona Ana | Slight | Moderate: shrink-swell, low strength. | Moderate: shrink-swell, low strength. | Moderate: shrink-swell, low strength. | Moderate: shrink-swell, low strength. |
| 16<br>Eba | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: slope, shrink-swell. | Moderate: shrink-swell. |
| 17<br>Eba | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. |
| 18*: | | | | | |
| Faraway | Severe: slope, depth to rock. | Severe: depth to rock, slope. | Severe: depth to rock, slope. | Severe: slope, depth to rock. | Severe: depth to rock, slope. |
| Rock outcrop. | | | | | |
| 19*: | | | | | |
| Forrest | Moderate: too clayey. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. |
| White House | Moderate: too clayey. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: shrink-swell, low strength. | Severe: low strength, shrink-swell. |
| Kimbrough | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. |
| 20<br>Gila | Slight | Severe: floods. | Severe: floods. | Severe: floods. | Moderate: floods, low strength. |
| 21*: | | | | | |
| Gila | Slight | Severe: floods. | Severe: floods. | Severe: floods. | Moderate: floods, low strength. |

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| 21*: | | | | | |
| Anthony | Slight | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Moderate:<br>floods. |
| Bluepoint | Severe:<br>cutbanks cave. | Slight | Slight | Moderate:<br>slope. | Slight. |
| 22*, 23*: | | | | | |
| Glendale | Slight | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>low strength. |
| Gila | Slight | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Moderate:<br>floods,<br>low strength. |
| 24*: | | | | | |
| Glendale | Moderate:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>low strength,<br>floods. |
| Gila | Moderate:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. |
| 25*: | | | | | |
| Graham | Severe:<br>depth to rock,<br>slope. | Severe:<br>depth to rock,<br>shrink-swell,<br>slope. | Severe:<br>depth to rock,<br>shrink-swell,<br>slope. | Severe:<br>depth to rock,<br>shrink-swell,<br>slope. | Severe:<br>depth to rock,<br>shrink-swell,<br>slope. |
| Rock outcrop. | | | | | |
| 26<br>Guest | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| 27*: | | | | | |
| Guest | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| Hantz | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| 28<br>Hondale | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| 29*: | | | | | |
| Hondale<br>(Loam) | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| Hondale<br>(Fine sandy loam) | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| Hondale<br>(Silt loam) | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| 30<br>Kimbrough | Severe:<br>cemented pan. | Severe:<br>cemented pan. | Severe:<br>cemented pan. | Severe:<br>cemented pan. | Severe:<br>cemented pan. |
| 31*: | | | | | |
| Mabray | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. |
| Rock outcrop. | | | | | |
| 32*: | | | | | |
| Mokiak | Severe:<br>slope,<br>depth to rock,<br>large stones. | Severe:<br>slope,<br>large stones. | Severe:<br>slope,<br>depth to rock,<br>large stones. | Severe:<br>slope,<br>large stones. | Severe:<br>slope,<br>large stones. |
| Faraway | Severe:<br>slope,<br>depth to rock. | Severe:<br>depth to rock,<br>slope. | Severe:<br>depth to rock,<br>slope. | Severe:<br>slope,<br>depth to rock. | Severe:<br>depth to rock,<br>slope. |
| Rock outcrop. | | | | | |
| 33*: | | | | | |
| Pima | Slight | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>low strength. |
| Grabe | Slight | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Moderate:<br>floods,<br>low strength. |
| 34*: | | | | | |
| Pima | Moderate:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods,<br>low strength. |
| Grabe | Moderate:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. |
| 35<br>Pridham | Severe:<br>wetness. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>wetness,<br>shrink-swell. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. |
| 36*: | | | | | |
| Santo Tomas (Cobbly fine sandy loam) | Moderate:<br>large stones. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Moderate:<br>floods,<br>large stones. |
| Santo Tomas (Very gravelly loam) | Slight | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Moderate:<br>floods. |
| 37<br>Signal | Severe:<br>slope. | Severe:<br>slope. | Severe:<br>slope. | Severe:<br>slope. | Severe:<br>slope. |
| 38, 39<br>Sonoita | Slight | Slight | Slight | Slight | Slight. |
| 40<br>Tres Hermanos | Slight | Moderate:<br>shrink-swell. | Moderate:<br>shrink-swell. | Moderate:<br>shrink-swell. | Moderate:<br>shrink-swell,<br>low strength. |
| 41<br>Tubac | Moderate:<br>too clayey. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>low strength,<br>shrink-swell. |

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| 42*: | | | | | |
| Tubac (Gravelly loam) | Moderate:<br>too clayey. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>low strength,<br>shrink-swell. |
| Tubac (Gravelly sandy loam) | Moderate:<br>too clayey. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>low strength,<br>shrink-swell. |
| 43*: | | | | | |
| Tubac | Moderate:<br>too clayey. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>low strength,<br>shrink-swell. |
| Sonoita | Slight | Slight | Slight | Slight | Slight. |
| 44 Vekol | Moderate:<br>too clayey. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>floods,<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |
| 45*: | | | | | |
| White House | Moderate:<br>too clayey. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>low strength,<br>shrink-swell. |
| Forrest | Moderate:<br>too clayey. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. | Severe:<br>shrink-swell,<br>low strength. |

* See description of the map unit for composition and behavior characteristics of the map unit.

## TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| 1*: | | | | | |
| Anthony | Severe:<br>floods. | Severe:<br>seepage,<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Good. |
| Gila | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Severe:<br>floods. | Good. |
| 2*: | | | | | |
| Arizo (Fine sandy loam) | Severe:<br>floods. | Severe:<br>floods,<br>seepage. | Severe:<br>floods,<br>too sandy. | Severe:<br>floods. | Poor:<br>small stones,<br>too sandy,<br>seepage. |
| Arizo (Gravelly sandy loam) | Severe:<br>floods. | Severe:<br>floods,<br>seepage. | Severe:<br>floods,<br>too sandy. | Severe:<br>floods. | Poor:<br>small stones,<br>too sandy,<br>seepage. |
| Arizo (Gravelly loamy sand) | Severe:<br>floods. | Severe:<br>floods,<br>seepage. | Severe:<br>floods,<br>too sandy. | Severe:<br>floods. | Poor:<br>small stones,<br>too sandy,<br>seepage. |
| 3<br>Artesia | Severe:<br>cemented pan,<br>percs slowly. | Severe:<br>cemented pan. | Severe:<br>cemented pan,<br>too clayey. | Slight | Poor:<br>small stones,<br>too clayey. |
| 4*: | | | | | |
| Atascosa | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Poor:<br>slope,<br>small stones,<br>area reclaim. |
| Chiricahua | Severe:<br>depth to rock,<br>slope,<br>percs slowly. | Severe:<br>depth to rock,<br>slope. | Severe:<br>depth to rock,<br>too clayey. | Severe:<br>slope. | Poor:<br>slope,<br>area reclaim. |
| Rock outcrop. | | | | | |
| 5*: | | | | | |
| Atascosa | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Poor:<br>slope,<br>small stones,<br>area reclaim. |
| Graham | Severe:<br>depth to rock,<br>slope,<br>percs slowly. | Severe:<br>depth to rock,<br>slope. | Severe:<br>depth to rock,<br>too clayey,<br>slope. | Severe:<br>depth to rock,<br>slope. | Poor:<br>area reclaim,<br>too clayey,<br>slope. |
| Rock outcrop. | | | | | |
| 6<br>Bluepoint | Slight | Severe:<br>slope,<br>seepage. | Moderate:<br>too sandy. | Slight | Fair:<br>too sandy. |
| 7*: | | | | | |
| Bluepoint | Slight | Severe:<br>slope,<br>seepage. | Moderate:<br>too sandy. | Slight | Fair:<br>too sandy. |

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| 7*: | | | | | |
| Gothard | Severe:<br>percs slowly. | Moderate:<br>seepage. | Severe:<br>excess sodium. | Slight | Poor:<br>excess sodium. |
| 8<br>Bonita | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| 9<br>Bucklebar | Moderate:<br>percs slowly. | Moderate:<br>seepage. | Slight | Slight | Good. |
| 10*: | | | | | |
| Calciorthids. | | | | | |
| Torriorthents. | | | | | |
| 11*: | | | | | |
| Cave | Severe:<br>cemented pan. | Severe:<br>slope,<br>cemented pan. | Severe:<br>cemented pan. | Slight | Poor:<br>thin layer,<br>area reclaim. |
| Durorthids. | | | | | |
| 12*: | | | | | |
| Comoro (Fine sandy loam) | Moderate:<br>floods. | Severe:<br>floods,<br>seepage. | Moderate:<br>floods. | Moderate:<br>floods. | Fair:<br>small stones. |
| Comoro (Gravelly sandy loam) | Moderate:<br>floods. | Severe:<br>floods,<br>seepage. | Moderate:<br>floods. | Moderate:<br>floods. | Fair:<br>small stones. |
| Comoro (Sandy loam) | Moderate:<br>floods. | Severe:<br>floods,<br>seepage. | Moderate:<br>floods. | Moderate:<br>floods. | Fair:<br>small stones. |
| 13*: | | | | | |
| Continental | Severe:<br>percs slowly. | Severe:<br>slope. | Severe:<br>too clayey. | Moderate:<br>slope. | Poor:<br>too clayey. |
| Tubac | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| 14<br>Dona Ana | Moderate:<br>percs slowly. | Moderate:<br>seepage. | Slight | Slight | Good. |
| 15<br>Dona Ana | Moderate:<br>percs slowly. | Moderate:<br>seepage,<br>slope. | Slight | Slight | Good. |
| 16, 17<br>Eba | Severe:<br>percs slowly. | Moderate:<br>slope. | Moderate:<br>too clayey. | Slight | Poor:<br>small stones. |
| 18*: | | | | | |
| Faraway | Severe:<br>depth to rock,<br>slope. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Severe:<br>slope,<br>depth to rock. | Poor:<br>slope,<br>thin layer,<br>area reclaim. |
| Rock outcrop. | | | | | |
| 19*: | | | | | |
| Forrest | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| White House | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>slope,<br>too clayey. | Slight | Poor:<br>too clayey. |

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| 19*: | | | | | |
| Kimbrough | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Slight | Poor: thin layer, area reclaim. |
| 20 Gila | Moderate: floods. | Severe: floods. | Moderate: floods. | Moderate: floods. | Good. |
| 21*: | | | | | |
| Gila | Moderate: floods. | Severe: floods. | Moderate: floods. | Moderate: floods. | Good. |
| Anthony | Moderate: floods. | Severe: seepage, floods. | Moderate: floods. | Moderate: floods. | Good. |
| Bluepoint | Slight | Severe: seepage. | Moderate: too sandy. | Slight | Fair: too sandy. |
| 22*, 23*: | | | | | |
| Glendale | Severe: percs slowly. | Severe: floods. | Moderate: floods, too clayey. | Moderate: floods. | Fair: too clayey. |
| Gila | Moderate: floods. | Severe: floods. | Moderate: floods. | Moderate: floods. | Good. |
| 24*: | | | | | |
| Glendale | Severe: floods, percs slowly. | Severe: floods. | Severe: floods. | Severe: floods. | Fair: too clayey. |
| Gila | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| 25*: | | | | | |
| Graham | Severe: depth to rock, slope, percs slowly. | Severe: depth to rock, slope. | Severe: depth to rock, too clayey, slope. | Severe: depth to rock, slope. | Poor: area reclaim, too clayey, slope. |
| Rock outcrop. | | | | | |
| 26 Guest | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |
| 27*: | | | | | |
| Guest | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |
| Hantz | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |
| 28 Hondale | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |
| 29*: | | | | | |
| Hondale (Loam) | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |
| Hondale (Fine sandy loam) | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |
| Hondale (Silt loam) | Severe: percs slowly. | Severe: floods. | Severe: too clayey. | Moderate: floods. | Poor: too clayey. |

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| 30<br>Kimbrough | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Slight | Poor: thin layer, area reclaim. |
| 31*: | | | | | |
| Mabray | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Poor: slope, thin layer, area reclaim. |
| Rock outcrop. | | | | | |
| 32*: | | | | | |
| Mokiak | Severe: slope, depth to rock. | Severe: slope, depth to rock, large stones. | Severe: slope, depth to rock, large stones. | Severe: slope. | Poor: slope, area reclaim, large stones. |
| Faraway | Severe: depth to rock, slope. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Poor: slope, thin layer, area reclaim. |
| Rock outcrop. | | | | | |
| 33*: | | | | | |
| Pima | Severe: percs slowly. | Severe: floods. | Moderate: floods, too clayey. | Moderate: floods. | Fair: too clayey. |
| Grabe | Moderate: floods, percs slowly. | Severe: floods. | Moderate: floods. | Moderate: floods. | Good. |
| 34*: | | | | | |
| Pima | Severe: floods, percs slowly. | Severe: floods. | Severe: floods. | Severe: floods. | Fair: too clayey. |
| Grabe | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| 35<br>Pridham | Severe: floods, percs slowly, wetness. | Severe: floods, wetness. | Severe: floods, wetness, too clayey. | Severe: floods, wetness. | Poor: too clayey, excess sodium. |
| 36*: | | | | | |
| Santo Tomas (Cobbly fine sandy loam) | Moderate: floods, large stones. | Severe: floods. | Moderate: floods, large stones. | Moderate: floods. | Fair: large stones. |
| Santo Tomas (Very gravelly loam) | Moderate: floods, percs slowly. | Severe: floods, seepage. | Moderate: floods. | Moderate: floods. | Poor: small stones. |
| 37<br>Signal | Severe: percs slowly, slope. | Severe: slope, seepage. | Severe: too clayey. | Severe: slope. | Poor: slope, small stones, too clayey. |
| 38, 39<br>Sonoita | Slight | Severe: seepage. | Slight | Slight | Fair: small stones. |
| 40<br>Tres Hermanos | Moderate: percs slowly. | Moderate: seepage. | Slight | Slight | Fair: small stones. |

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| 41<br>Tubac | Severe:<br>percs slowly. | Slight | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| 42*: | | | | | |
| Tubac<br>(Gravelly loam) | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| Tubac<br>(Gravelly sandy loam) | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| 43*: | | | | | |
| Tubac | Severe:<br>percs slowly. | Slight | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| Sonoita | Slight | Severe:<br>seepage. | Slight | Slight | Fair:<br>small stones. |
| 44<br>Vekol | Severe:<br>percs slowly. | Severe:<br>floods. | Severe:<br>too clayey. | Moderate:<br>floods. | Poor:<br>too clayey. |
| 45*: | | | | | |
| White House | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |
| Forrest | Severe:<br>percs slowly. | Moderate:<br>slope. | Severe:<br>too clayey. | Slight | Poor:<br>too clayey. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| 1*: | | | | |
| Anthony | Good | Poor:<br>excess fines. | Unsuited | Fair:<br>small stones. |
| Gila | Fair:<br>low strength. | Unsuited | Unsuited | Good. |
| 2*: | | | | |
| Arizo (Fine sandy loam) | Good | Unsuited | Good | Poor:<br>small stones,<br>too sandy. |
| Arizo (Gravelly sandy loam) | Good | Unsuited | Good | Poor:<br>small stones,<br>too sandy. |
| Arizo (Gravelly loamy sand) | Good | Unsuited | Good | Poor:<br>small stones,<br>too sandy. |
| 3<br>Artesia | Poor:<br>thin layer,<br>shrink-swell,<br>area reclaim. | Unsuited | Unsuited | Poor:<br>small stones. |
| 4*: | | | | |
| Atascosa | Poor:<br>slope,<br>thin layer,<br>area reclaim. | Unsuited | Unsuited | Poor:<br>slope,<br>large stones,<br>thin layer. |
| Chiricahua | Poor:<br>thin layer,<br>area reclaim,<br>low strength. | Unsuited | Unsuited | Poor:<br>slope,<br>too clayey,<br>small stones. |
| Rock outcrop. | | | | |
| 5*: | | | | |
| Atascosa | Poor:<br>slope,<br>thin layer,<br>area reclaim. | Unsuited | Unsuited | Poor:<br>slope,<br>large stones,<br>thin layer. |
| Graham | Poor:<br>thin layer,<br>low strength,<br>slope. | Unsuited | Unsuited | Poor:<br>slope,<br>too clayey,<br>large stones. |
| Rock outcrop. | | | | |
| 6<br>Bluepoint | Good | Poor:<br>excess fines. | Unsuited | Fair:<br>too sandy,<br>excess salt. |
| 7*: | | | | |
| Bluepoint | Good | Poor:<br>excess fines. | Unsuited | Fair:<br>too sandy,<br>excess salt. |
| Gothard | Fair:<br>low strength,<br>shrink-swell. | Poor:<br>excess fines. | Unsuited | Poor:<br>excess salt,<br>excess sodium. |

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| 8<br>Bonita | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey. |
| 9<br>Bucklebar | Fair:<br>shrink-swell,<br>low-strength. | Unsuited | Unsuited | Fair:<br>too clayey. |
| 10*:<br>Calciorthids. | | | | |
| Torriorthents. | | | | |
| 11*:<br>Cave | Poor:<br>thin layer,<br>area reclaim. | Unsuited | Unsuited | Poor:<br>small stones,<br>area reclaim,<br>thin layer. |
| Durorthids. | | | | |
| 12*:<br>Comoro<br>(Fine sandy loam) | Good | Poor:<br>excess fines. | Poor:<br>excess fines. | Fair:<br>small stones. |
| Comoro<br>(Gravelly sandy loam) | Good | Poor:<br>excess fines. | Poor:<br>excess fines. | Poor:<br>small stones. |
| Comoro<br>(Sandy loam) | Good | Poor:<br>excess fines. | Poor:<br>excess fines. | Fair:<br>small stones. |
| 13*:<br>Continental | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>small stones,<br>too clayey. |
| Tubac | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>small stones. |
| 14, 15<br>Dona Ana | Fair:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Fair:<br>too clayey. |
| 16, 17<br>Eba | Fair:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey,<br>small stones. |
| 18*:<br>Faraway | Poor:<br>slope,<br>thin layer,<br>area reclaim. | Unsuited | Unsuited | Poor:<br>slope,<br>small stones,<br>area reclaim. |
| Rock outcrop. | | | | |
| 19*:<br>Forrest | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey. |
| White House | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>too clayey. |
| Kimbrough | Poor:<br>area reclaim,<br>thin layer. | Unsuited | Unsuited | Poor:<br>area reclaim,<br>small stones. |

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| 20<br>Gila | Fair:<br>low strength. | Poor:<br>excess fines. | Unsuited | Good. |
| 21*: | | | | |
| Gila | Fair:<br>low strength. | Poor:<br>excess fines. | Unsuited | Good. |
| Anthony | Good | Poor:<br>excess fines. | Poor:<br>excess fines. | Good. |
| Bluepoint | Good | Poor:<br>excess fines. | Unsuited | Fair:<br>too sandy,<br>excess salt. |
| 22*, 23*: | | | | |
| Glendale | Poor:<br>low strength. | Unsuited | Unsuited | Fair:<br>too clayey. |
| Gila | Fair:<br>low strength. | Poor:<br>excess fines. | Unsuited | Good. |
| 24*: | | | | |
| Glendale | Poor:<br>low strength. | Unsuited | Unsuited | Fair:<br>too clayey. |
| Gila | Fair:<br>low strength. | Unsuited | Unsuited | Good. |
| 25*: | | | | |
| Graham | Poor:<br>thin layer,<br>low strength,<br>slope. | Unsuited | Unsuited | Poor:<br>slope,<br>too clayey,<br>large stones. |
| Rock outcrop. | | | | |
| 26<br>Guest | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey. |
| 27*: | | | | |
| Guest | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey. |
| Hantz | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey. |
| 28<br>Hondale | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>excess salt,<br>too clayey. |
| 29*: | | | | |
| Hondale<br>(Loam) | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>excess salt,<br>too clayey. |
| Hondale<br>(Fine sandy loam) | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>excess salt,<br>too clayey. |
| Hondale<br>(Silt loam) | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>excess salt,<br>too clayey. |

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| 30 Kimbrough | Poor: area reclaim, thin layer. | Unsuited | Unsuited | Poor: area reclaim, small stones. |
| 31*: | | | | |
| Mabray | Poor: slope, thin layer, area reclaim. | Unsuited | Unsuited | Poor: slope, small stones, area reclaim. |
| Rock outcrop. | | | | |
| 32*: | | | | |
| Mokiak | Poor: slope, thin layer, large stones. | Unsuited | Unsuited | Poor: slope, small stones. |
| Faraway | Poor: slope, thin layer, area reclaim. | Unsuited | Unsuited | Poor: slope, small stones, area reclaim. |
| Rock outcrop. | | | | |
| 33*: | | | | |
| Pima | Poor: low strength. | Unsuited | Unsuited | Good. |
| Grabe | Fair: low strength. | Unsuited | Unsuited | Good. |
| 34*: | | | | |
| Pima | Poor: low strength. | Unsuited | Unsuited | Fair: too clayey. |
| Grabe | Fair: low strength. | Unsuited | Unsuited | Fair: small stones. |
| 35 Pridham | Poor: shrink-swell, low strength. | Unsuited | Unsuited | Poor: too clayey, excess sodium, excess salt. |
| 36*: | | | | |
| Santo Tomas | Fair: large stones. | Unsuited | Poor: excess fines. | Poor: large stones. |
| Santo Tomas | Good | Poor: excess fines. | Poor: excess fines. | Poor: small stones. |
| 37 Signal | Fair: slope, shrink-swell. | Unsuited | Fair: excess fines. | Poor: small stones, slope, too clayey. |
| 38, 39 Sonoita | Good | Unsuited | Unsuited | Poor: small stones. |
| 40 Tres Hermanos | Fair: shrink-swell, low strength. | Unsuited | Unsuited | Poor: small stones. |
| 41 Tubac | Poor: low strength, shrink-swell. | Unsuited | Unsuited | Fair: too clayey. |

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| 42*: | | | | |
| Tubac (Gravelly loam) | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>small stones. |
| Tubac (Gravelly sandy loam) | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>small stones. |
| 43*: | | | | |
| Tubac | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Good. |
| Sonoita | Good | Unsuited | Unsuited | Poor:<br>small stones. |
| 44<br>Vekol | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>too clayey. |
| 45*: | | | | |
| White House | Poor:<br>low strength,<br>shrink-swell. | Unsuited | Unsuited | Poor:<br>too clayey. |
| Forrest | Poor:<br>shrink-swell,<br>low strength. | Unsuited | Unsuited | Poor:<br>too clayey. |

* See description of the map unit for composition and behavior characteristics of the map unit.

## TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Aquifer-fed excavated ponds | Drainage | Irrigation | Terraces and diversions |
|---|---|---|---|---|---|---|
| 1*: | | | | | | |
| Anthony | Seepage | Piping, seepage. | No water | Floods, soil blowing. | Floods | Soil blowing. |
| Gila | Seepage | Piping | No water | Floods | Floods | Erodes easily. |
| 2*: | | | | | | |
| Arizo (Fine sandy loam) | Seepage, slope. | Seepage | No water | Slope, floods. | Slope, floods, droughty. | Too sandy, soil blowing. |
| Arizo (Gravelly sandy loam) | Seepage, slope. | Seepage | No water | Slope, floods. | Slope, floods, droughty. | Too sandy, soil blowing. |
| Arizo (Gravelly loamy sand) | Seepage, slope. | Seepage | No water | Slope, floods. | Slope, floods, droughty. | Too sandy, soil blowing. |
| 3 Artesia | Cemented pan | Thin layer | No water | Slope, cemented pan. | Slope, droughty, rooting depth. | Cemented pan, soil blowing. |
| 4*: | | | | | | |
| Atascosa | Depth to rock, slope. | Thin layer, large stones. | No water | Depth to rock, slope. | Large stones, slope, rooting depth. | Slope, depth to rock, large stones. |
| Chiricahua | Depth to rock, slope. | Thin layer, hard to pack. | No water | Slope, percs slowly, depth to rock. | Slope, percs slowly, rooting depth. | Slope, depth to rock, percs slowly. |
| Rock outcrop. | | | | | | |
| 5*: | | | | | | |
| Atascosa | Depth to rock, slope. | Thin layer, large stones. | No water | Depth to rock, slope. | Large stones, slope, rooting depth. | Slope, depth to rock, large stones. |
| Graham | Slope, depth to rock. | Thin layer, hard to pack. | No water | Slope, depth to rock, percs slowly. | Slope, rooting depth, percs slowly. | Depth to rock, slope, percs slowly. |
| Rock outcrop. | | | | | | |
| 6 Bluepoint | Seepage, slope. | Piping | No water | Slope | Droughty, slope, too sandy. | Too sandy, soil blowing. |
| 7*: | | | | | | |
| Bluepoint | Seepage, slope. | Piping | No water | Slope | Droughty, slope, too sandy. | Too sandy, soil blowing. |
| Gothard | Seepage | Excess sodium, excess salt. | No water | Percs slowly, excess salt, excess sodium. | Excess sodium, percs slowly, excess salt. | Percs slowly, soil blowing, erodes easily. |
| 8 Bonita | Slope | Hard to pack | No water | Percs slowly, slope. | Slope, percs slowly, too clayey. | Percs slowly. |
| 9 Bucklebar | Seepage | Favorable | No water | Favorable | Soil blowing | Soil blowing. |

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Aquifer-fed excavated ponds | Drainage | Irrigation | Terraces and diversions |
|---|---|---|---|---|---|---|
| 10*:<br>Calciorthids. | | | | | | |
| Torriorthents. | | | | | | |
| 11*:<br>Cave | Slope, cemented pan. | Thin layer, seepage. | No water | Cemented pan, slope. | Slope, droughty, rooting depth. | Cemented pan, slope. |
| Durorthids. | | | | | | |
| 12*:<br>Comoro (Fine sandy loam) | Seepage, slope. | Piping, seepage. | No water | Slope | Slope, soil blowing, droughty. | Soil blowing. |
| Comoro (Gravelly sandy loam) | Seepage, slope. | Piping, seepage. | No water | Slope | Slope, soil blowing, droughty. | Soil blowing. |
| Comoro (Sandy loam) | Seepage, slope. | Piping, seepage. | No water | Slope | Slope, soil blowing, droughty. | Soil blowing. |
| 13*:<br>Continental | Slope | Favorable | No water | Percs slowly, slope. | Percs slowly, soil blowing, slope. | Percs slowly, soil blowing, slope. |
| Tubac | Slope | Hard to pack | No water | Slope, percs slowly. | Percs slowly, slope. | Percs slowly, slope. |
| 14<br>Dona Ana | Seepage | Favorable | No water | Favorable | Soil blowing | Soil blowing. |
| 15<br>Dona Ana | Seepage, slope. | Favorable | No water | Slope | Slope, soil blowing. | Soil blowing. |
| 16, 17<br>Eba | Slope | Favorable | No water | Slope, percs slowly. | Slope, droughty, percs slowly. | Percs slowly. |
| 18*:<br>Faraway | Slope, depth to rock, seepage. | Thin layer, seepage, large stones. | No water | Slope, depth to rock, large stones. | Slope, rooting depth, large stones. | Slope, depth to rock, large stones. |
| Rock outcrop. | | | | | | |
| 19*:<br>Forrest | Slope | Hard to pack | No water | Slope, percs slowly. | Slope, percs slowly, soil blowing. | Percs slowly, slope, soil blowing. |
| White House | Slope | Hard to pack | No water | Slope, percs slowly. | Slope, percs slowly. | Percs slowly, slope. |
| Kimbrough | Cemented pan, slope. | Thin layer | No water | Cemented pan, slope. | Slope, rooting depth, droughty. | Cemented pan, slope. |
| 20<br>Gila | Seepage | Piping | No water | Favorable | Favorable | Favorable. |
| 21*:<br>Gila | Seepage | Piping | No water | Favorable | Favorable | Erodes easily. |
| Anthony | Seepage | Seepage, piping. | No water | Favorable | Soil blowing | Soil blowing. |

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Aquifer-fed excavated ponds | Drainage | Irrigation | Terraces and diversions |
|---|---|---|---|---|---|---|
| 21*: | | | | | | |
| Bluepoint | Seepage | Piping | No water | Favorable | Droughty, too sandy, soil blowing. | Too sandy, soil blowing. |
| 22*, 23*: | | | | | | |
| Glendale | Favorable | Favorable | No water | Favorable | Favorable | Favorable. |
| Gila | Seepage | Piping | No water | Favorable | Favorable | Favorable. |
| 24*: | | | | | | |
| Glendale | Favorable | Favorable | No water | Floods | Floods | Favorable. |
| Gila | Seepage | Piping | No water | Floods | Floods | Favorable. |
| 25*: | | | | | | |
| Graham | Slope, depth to rock. | Thin layer, hard to pack. | No water | Slope, depth to rock, percs slowly. | Slope, rooting depth, large stones. | Depth to rock, slope, percs slowly. |
| Rock outcrop. | | | | | | |
| 26<br>Guest | Favorable | Hard to pack | No water | Percs slowly | Percs slowly | Percs slowly. |
| 27*: | | | | | | |
| Guest | Favorable | Hard to pack | No water | Percs slowly | Percs slowly, too clayey. | Percs slowly. |
| Hantz | Favorable | Hard to pack | No water | Percs slowly | Percs slowly | Percs slowly. |
| 28<br>Hondale | Favorable | Excess salt, hard to pack. | No water | Percs slowly, excess salt. | Percs slowly, excess salt. | Percs slowly. |
| 29*: | | | | | | |
| Hondale (Loam) | Favorable | Excess salt, hard to pack. | No water | Percs slowly, excess salt. | Percs slowly, excess salt. | Percs slowly. |
| Hondale (Fine sandy loam) | Favorable | Excess salt, hard to pack. | No water | Percs slowly, excess salt. | Percs slowly, excess salt, soil blowing. | Percs slowly, soil blowing. |
| Hondale (Silt loam) | Favorable | Excess salt, hard to pack. | No water | Percs slowly, excess salt. | Percs slowly, excess salt. | Percs slowly. |
| 30<br>Kimbrough | Cemented pan, slope. | Thin layer | No water | Cemented pan, slope. | Slope, rooting depth. | Cemented pan, slope. |
| 31*: | | | | | | |
| Mabray | Depth to rock, slope. | Thin layer | No water | Depth to rock, slope. | Slope, rooting depth, droughty. | Slope, depth to rock. |
| Rock outcrop. | | | | | | |
| 32*: | | | | | | |
| Mokiak | Slope, depth to rock. | Thin layer, large stones. | No water | Slope, depth to rock, large stones. | Slope, large stones, rooting depth. | Slope, large stones, depth to rock. |
| Faraway | Slope, depth to rock, seepage. | Thin layer, seepage, large stones. | No water | Slope, depth to rock, large stones. | Slope, rooting depth, large stones. | Slope, depth to rock, large stones. |
| Rock outcrop. | | | | | | |
| 33*: | | | | | | |
| Pima | Favorable | Favorable | No water | Favorable | Favorable | Favorable. |
| Grabe | Seepage | Favorable | No water | Favorable | Favorable | Favorable. |

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Aquifer-fed excavated ponds | Drainage | Irrigation | Terraces and diversions |
|---|---|---|---|---|---|---|
| 34*: | | | | | | |
| Pima | Favorable | Favorable | No water | Floods | Floods | Favorable. |
| Grabe | Seepage | Favorable | No water | Floods | Floods | Favorable. |
| 35 Pridham | Favorable | Hard to pack, wetness, excess sodium. | Slow refill, salty water. | Percs slowly, excess salt, excess sodium. | Excess sodium, percs slowly, wetness. | Percs slowly, wetness. |
| 36*: | | | | | | |
| Santo Tomas (Cobbly fine sandy loam) | Seepage, slope. | Large stones, seepage. | No water | Slope | Large stones, slope, droughty. | Large stones. |
| Santo Tomas (Very gravelly loam) | Seepage, slope. | Seepage | No water | Slope | Droughty, slope. | Favorable. |
| 37 Signal | Seepage, slope. | Seepage | No water | Slope, percs slowly. | Percs slowly, slope. | Slope, percs slowly. |
| 38 Sonoita | Seepage, slope. | Favorable | No water | Slope | Slope, droughty, soil blowing. | Soil blowing. |
| 39 Sonoita | Seepage, slope. | Favorable | No water | Slope | Droughty, soil blowing, slope. | Soil blowing. |
| 40 Tres Hermanos | Seepage | Seepage | No water | Favorable | Droughty | Favorable. |
| 41 Tubac | Favorable | Hard to pack | No water | Percs slowly | Percs slowly | Percs slowly. |
| 42*: | | | | | | |
| Tubac (Gravelly loam) | Slope | Hard to pack | No water | Slope, percs slowly. | Percs slowly, slope. | Percs slowly. |
| Tubac (Gravelly sandy loam) | Slope | Hard to pack | No water | Slope, percs slowly. | Percs slowly, slope. | Percs slowly. |
| 43*: | | | | | | |
| Tubac | Favorable | Hard to pack | No water | Percs slowly | Percs slowly | Percs slowly. |
| Sonoita | Seepage | Favorable | No water | Favorable | Droughty, soil blowing. | Soil blowing. |
| 44 Vekol | Seepage | Hard to pack | No water | Percs slowly | Percs slowly | Percs slowly. |
| 45*: | | | | | | |
| White House | Slope | Hard to pack | No water | Slope, percs slowly. | Slope, percs slowly. | Percs slowly. |
| Forrest | Slope | Hard to pack | No water | Slope, percs slowly. | Slope, percs slowly, soil blowing. | Percs slowly, soil blowing. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| 1*: | | | | |
| Anthony | Severe: floods. | Moderate: floods. | Severe: floods. | Moderate: floods. |
| Gila | Severe: floods. | Moderate: floods. | Severe: floods. | Moderate: floods. |
| 2*: | | | | |
| Arizo (Fine sandy loam) | Severe: floods. | Slight | Moderate: floods, slope, small stones. | Slight. |
| Arizo (Gravelly sandy loam) | Severe: floods. | Moderate: small stones. | Severe: small stones. | Moderate: small stones. |
| Arizo (Gravelly loamy sand) | Severe: floods. | Moderate: small stones, too sandy. | Severe: small stones. | Moderate: small stones, too sandy. |
| 3<br>Artesia | Moderate: percs slowly, large stones. | Moderate: large stones. | Severe: large stones. | Moderate: large stones. |
| 4*: | | | | |
| Atascosa | Severe: slope, large stones, depth to rock. | Severe: slope, large stones. | Severe: slope, depth to rock, large stones. | Severe: slope, large stones. |
| Chiricahua | Severe: slope. | Severe: slope. | Severe: small stones, slope, depth to rock. | Moderate: slope, small stones. |
| Rock outcrop. | | | | |
| 5*: | | | | |
| Atascosa | Severe: slope, large stones, depth to rock. | Severe: slope, large stones. | Severe: slope, depth to rock, large stones. | Severe: slope, large stones. |
| Graham | Severe: slope, large stones, depth to rock. | Severe: slope, large stones. | Severe: slope, large stones, depth to rock. | Severe: slope, large stones. |
| Rock outcrop. | | | | |
| 6<br>Bluepoint | Moderate: too sandy. | Moderate: too sandy. | Severe: slope. | Moderate: too sandy. |
| 7*: | | | | |
| Bluepoint | Moderate: too sandy. | Moderate: too sandy. | Severe: slope. | Moderate: too sandy. |
| Gothard | Slight | Slight | Slight | Slight. |
| 8<br>Bonita | Severe: too clayey, large stones. | Severe: too clayey, large stones. | Severe: too clayey, large stones. | Severe: too clayey, large stones. |

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| 9<br>Bucklebar | Slight | Slight | Slight | Slight. |
| 10*: | | | | |
| Calciorthids. | | | | |
| Torriorthents. | | | | |
| 11*: | | | | |
| Cave | Moderate: small stones. | Moderate: small stones. | Severe: slope, cemented pan, small stones. | Moderate: small stones. |
| Durorthids. | | | | |
| 12*: | | | | |
| Comoro (Fine sandy loam) | Severe: floods. | Slight | Moderate: slope. | Slight. |
| Comoro (Gravelly sandy loam) | Severe: floods. | Moderate: small stones. | Severe: small stones. | Moderate: small stones. |
| Comoro (Sandy loam) | Severe: floods. | Slight | Moderate: slope. | Slight. |
| 13*: | | | | |
| Continental | Moderate: small stones, slope. | Moderate: small stones, slope. | Severe: slope, small stones. | Moderate: small stones. |
| Tubac | Moderate: small stones. | Moderate: small stones. | Severe: small stones. | Moderate: small stones. |
| 14<br>Dona Ana | Slight | Slight | Slight | Slight. |
| 15<br>Dona Ana | Slight | Slight | Moderate: slope. | Slight. |
| 16, 17<br>Eba | Moderate: small stones. | Moderate: small stones. | Severe: small stones. | Moderate: small stones. |
| 18*: | | | | |
| Faraway | Severe: slope, large stones, depth to rock. | Severe: slope, large stones, depth to rock. | Severe: large stones, depth to rock, slope. | Severe: slope, large stones. |
| Rock outcrop. | | | | |
| 19*: | | | | |
| Forrest | Moderate: small stones. | Moderate: small stones. | Severe: small stones. | Moderate: small stones. |
| White House | Moderate: small stones. | Moderate: small stones. | Severe: slope, small stones. | Moderate: small stones. |
| Kimbrough | Slope, small stones. | Moderate: slope, small stones. | Severe: slope, cemented pan, small stones. | Moderate: small stones. |
| 20<br>Gila | Severe: floods. | Slight | Slight | Slight. |
| 21*: | | | | |
| Gila | Severe: floods. | Slight | Slight | Slight. |

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| 21*: | | | | |
| Anthony | Severe: floods. | Slight | Moderate: slope. | Slight. |
| Bluepoint | Severe: floods. | Moderate: too sandy. | Moderate: slope, too sandy. | Moderate: too sandy. |
| 22*, 23*: | | | | |
| Glendale | Severe: floods. | Moderate: dusty. | Moderate: dusty. | Moderate: dusty. |
| Gila | Severe: floods. | Slight | Slight | Slight. |
| 24*: | | | | |
| Glendale | Severe: floods. | Moderate: floods. | Severe: floods. | Moderate: floods. |
| Gila | Severe: floods. | Moderate: floods. | Severe: floods. | Moderate: floods. |
| 25*: | | | | |
| Graham | Severe: slope, large stones, depth to rock. | Severe: slope, large stones, depth to rock. | Severe: slope, large stones, depth to rock. | Severe: slope, large stones. |
| Rock outcrop. | | | | |
| 26 Guest | Severe: floods. | Moderate: percs slowly. | Moderate: too clayey. | Slight. |
| 27*: | | | | |
| Guest | Severe: floods. | Moderate: too clayey. | Severe: too clayey. | Moderate: too clayey. |
| Hantz | Severe: floods. | Moderate: dusty, percs slowly. | Moderate: percs slowly, dusty. | Moderate: dusty. |
| 28 Hondale | Severe: floods. | Moderate: percs slowly. | Moderate: percs slowly. | Slight. |
| 29*: | | | | |
| Hondale (Loam) | Severe: floods. | Moderate: percs slowly. | Moderate: percs slowly. | Slight. |
| Hondale (Fine sandy loam) | Severe: floods. | Moderate: percs slowly. | Moderate: percs slowly. | Slight. |
| Hondale (Silt loam) | Severe: floods. | Moderate: dusty, percs slowly. | Moderate: dusty, percs slowly. | Moderate: dusty. |
| 30 Kimbrough | Moderate: small stones. | Moderate: small stones. | Severe: cemented pan, small stones. | Moderate: small stones. |
| 31*: | | | | |
| Mabray | Severe: slope, small stones, depth to rock. | Severe: slope, small stones, depth to rock. | Severe: slope, depth to rock, small stones. | Severe: slope, depth to rock, small stones. |
| Rock outcrop. | | | | |

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| 32*: | | | | |
| Mokiak | Severe:<br>slope,<br>large stones. | Severe:<br>slope,<br>large stones. | Severe:<br>slope,<br>large stones. | Severe:<br>slope,<br>large stones. |
| Faraway | Severe:<br>slope,<br>large stones,<br>depth to rock. | Severe:<br>slope,<br>large stones,<br>depth to rock. | Severe:<br>large stones,<br>depth to rock,<br>slope. | Severe:<br>slope,<br>large stones. |
| Rock outcrop. | | | | |
| 33*: | | | | |
| Pima | Severe:<br>floods. | Moderate:<br>dusty. | Moderate:<br>dusty. | Moderate:<br>dusty. |
| Grabe | Severe:<br>floods. | Moderate:<br>small stones,<br>dusty. | Severe:<br>small stones. | Moderate:<br>dusty. |
| 34*: | | | | |
| Pima | Severe:<br>floods. | Moderate:<br>floods,<br>dusty. | Severe:<br>floods. | Moderate:<br>floods,<br>dusty. |
| Grabe | Severe:<br>floods. | Moderate:<br>floods,<br>small stones. | Severe:<br>small stones. | Moderate:<br>small stones. |
| 35<br>Pridham | Severe:<br>floods. | Moderate:<br>wetness,<br>too clayey,<br>percs slowly. | Moderate:<br>floods,<br>wetness,<br>percs slowly. | Moderate:<br>too clayey. |
| 36*: | | | | |
| Santo Tomas (Cobbly fine sandy loam) | Severe:<br>floods,<br>large stones. | Moderate:<br>large stones. | Severe:<br>large stones. | Severe:<br>large stones. |
| Santo Tomas (Very gravelly loam) | Severe:<br>floods,<br>small stones. | Severe:<br>small stones. | Severe:<br>large stones. | Severe:<br>small stones. |
| 37<br>Signal | Severe:<br>slope. | Severe:<br>slope. | Severe:<br>small stones,<br>slope. | Moderate:<br>slope,<br>small stones. |
| 38<br>Sonoita | Moderate:<br>small stones. | Moderate:<br>small stones. | Severe:<br>small stones. | Moderate:<br>small stones. |
| 39<br>Sonoita | Slight | Slight | Slight | Slight. |
| 40<br>Tres Hermanos | Moderate:<br>small stones. | Moderate:<br>small stones. | Severe:<br>small stones. | Moderate:<br>small stones. |
| 41<br>Tubac | Moderate:<br>too clayey. | Moderate:<br>too clayey. | Moderate:<br>too clayey. | Moderate:<br>too clayey. |
| 42*: | | | | |
| Tubac (Gravelly loam) | Moderate:<br>small stones. | Moderate:<br>small stones. | Severe:<br>small stones. | Moderate:<br>small stones. |
| Tubac (Gravelly sandy loam) | Moderate:<br>small stones. | Moderate:<br>small stones. | Severe:<br>small stones. | Moderate:<br>small stones. |
| 43*: | | | | |
| Tubac | Slight | Slight | Slight | Slight. |

See footnote at end of table.

TABLE 14.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| 43*: | | | | |
| Sonoita | Slight | Slight | Slight | Slight. |
| 44 Vekol | Severe: floods. | Slight | Slight | Slight. |
| 45*: | | | | |
| White House | Moderate: small stones. | Moderate: small stones. | Severe: small stones. | Moderate: small stones. |
| Forrest | Slight | Slight | Moderate: slope. | Slight. |

* See description of the map unit for composition and behavior characteristics of the map unit.

## TABLE 15.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Potential for habitat elements | | | | | | | | Potential as habitat for-- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Shrubs | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife | Rangeland wildlife |
| 1*:<br>Anthony | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Gila | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 2*:<br>Arizo (Fine sandy loam) | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Arizo (Gravelly sandy loam) | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Arizo (Gravelly loamy sand) | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 3<br>Artesia | Poor | Poor | Fair | --- | --- | Poor | Poor | Very poor | Poor | --- | Very poor | Poor |
| 4*:<br>Atascosa | Very poor | Very poor | Poor | Very poor | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Chiricahua | Poor | Poor | Fair | --- | --- | Fair | Very poor | Very poor | Poor | --- | Very poor | Fair |
| Rock outcrop. | | | | | | | | | | | | |
| 5*:<br>Atascosa | Very poor | Very poor | Poor | Very poor | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Graham | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Rock outcrop. | | | | | | | | | | | | |
| 6<br>Bluepoint | Fair | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 7*:<br>Bluepoint | Fair | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Gothard | Very poor | Very poor | Very poor | --- | --- | Very poor | Very poor | Very poor | Very poor | --- | Very poor | --- |
| 8<br>Bonita | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 9<br>Bucklebar | Good | Good | Good | --- | --- | Good | Very poor | Very poor | Good | --- | Very poor | Poor |
| 10*:<br>Calciorthids. | | | | | | | | | | | | |
| Torriorthents. | | | | | | | | | | | | |
| 11*:<br>Cave | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

| Soil name and map symbol | Potential for habitat elements | | | | | | | | Potential as habitat for-- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Shrubs | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife | Rangeland wildlife |
| 11*:<br>Durorthids. | | | | | | | | | | | | |
| 12*:<br>Comoro<br>(Fine sandy loam) | Poor | Poor | Poor | --- | --- | Poor | Very poor | Very poor | Poor | --- | Very poor | Poor |
| Comoro<br>(Gravelly sandy loam) | Poor | Poor | Poor | --- | --- | Poor | Very poor | Very poor | Poor | --- | Very poor | Poor |
| Comoro<br>(Sandy loam) | Poor | Poor | Poor | --- | --- | Poor | Very poor | Very poor | Poor | --- | Very poor | Poor |
| 13*:<br>Continental | Poor | Poor | Fair | --- | --- | Fair | Very poor | Very poor | Poor | --- | Very poor | Fair |
| Tubac | Poor | Poor | Fair | --- | --- | Fair | Very poor | Very poor | Poor | --- | Very poor | Fair |
| 14<br>Dona Ana | Good | Good | Poor | --- | --- | Poor | Poor | Very poor | Fair | --- | Very poor | --- |
| 15<br>Dona Ana | Very poor | Very poor | Poor | --- | --- | Poor | Poor | Very poor | Very poor | --- | Very poor | Poor |
| 16<br>Eba | Poor | Poor | Poor | --- | --- | Fair | Very poor | Very poor | Poor | --- | Very poor | Fair |
| 17<br>Eba | Fair | Fair | Fair | --- | --- | Fair | Fair | Poor | Fair | --- | Poor | Fair |
| 18*:<br>Faraway | Very poor | Very poor | Fair | Poor | --- | Fair | Very poor | Very poor | Very poor | Poor | --- | Fair |
| Rock outcrop. | | | | | | | | | | | | |
| 19*:<br>Forrest | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| White House | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Kimbrough | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 20<br>Gila | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 21*:<br>Gila | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Anthony | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Bluepoint | Fair | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 22*:<br>Glendale | Good | Good | Fair | --- | --- | Fair | Good | Fair | Good | --- | Good | Fair |
| Gila | Good | Good | Fair | --- | --- | Fair | Good | Fair | Good | --- | Good | Fair |

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

| Soil name and map symbol | Potential for habitat elements | | | | | | | | Potential as habitat for-- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Shrubs | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife | Rangeland wildlife |
| 23*: | | | | | | | | | | | | |
| Glendale | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Gila | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 24*: | | | | | | | | | | | | |
| Glendale | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Gila | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 25*: | | | | | | | | | | | | |
| Graham | Very poor | Very poor | Fair | Poor | --- | Fair | Very poor | Very poor | Very poor | Poor | Very poor | Fair |
| Rock outcrop. | | | | | | | | | | | | |
| 26<br>Guest | Good | Good | Good | --- | --- | Fair | Good | Good | Good | --- | Good | Poor |
| 27*: | | | | | | | | | | | | |
| Guest | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Hantz | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 28<br>Hondale | Poor | Poor | Fair | --- | --- | Poor | Fair | Fair | Fair | --- | Fair | Poor |
| 29*: | | | | | | | | | | | | |
| Hondale (Loam) | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Hondale (Fine sandy loam) | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Hondale (Silt loam) | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 30<br>Kimbrough | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 31*: | | | | | | | | | | | | |
| Mabray | Very poor | Very poor | Poor | Very poor | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| Rock outcrop. | | | | | | | | | | | | |
| 32*: | | | | | | | | | | | | |
| Mokiak | Very poor | Very poor | Fair | --- | Fair | Fair | Very poor | Very poor | Poor | Fair | Very poor | Fair |
| Faraway | Very poor | Very poor | Fair | Poor | --- | Fair | Very poor | Very poor | Very poor | Poor | --- | Fair |
| Rock outcrop. | | | | | | | | | | | | |
| 33*: | | | | | | | | | | | | |
| Pima | Good | Good | Fair | --- | --- | Good | Good | Good | Good | --- | Good | Poor |
| Grabe | Good | Good | Fair | --- | --- | Good | Good | Poor | Good | --- | Very poor | Poor |

See footnote at end of table.

TABLE 15.--WILDLIFE HABITAT POTENTIALS--Continued

| Soil name and map symbol | Potential for habitat elements | | | | | | | | Potential as habitat for-- | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Shrubs | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife | Rangeland wildlife |
| 34*: | | | | | | | | | | | | |
| Pima | Poor | Poor | Fair | --- | --- | Fair | Very poor | Very poor | Poor | --- | Very poor | Fair |
| Grabe | Poor | Poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 35 Pridham | Very poor | Very poor | Very poor | --- | --- | Very poor | Fair | Fair | Very poor | --- | Fair | Very poor |
| 36*: | | | | | | | | | | | | |
| Santo Tomas (Cobbly fine sandy loam) | Poor | Poor | Poor | --- | --- | Poor | Poor | Very poor | Poor | --- | Very poor | Poor |
| Santo Tomas (Very gravelly loam) | Poor | Poor | Poor | --- | --- | Poor | Poor | Very poor | Poor | --- | Very poor | Poor |
| 37 Signal | Very poor | Poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 38 Sonoita | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 39 Sonoita | Good | Good | Good | --- | --- | Poor | Very poor | Very poor | Good | --- | Very poor | Good |
| 40 Tres Hermanos | Very poor | Very poor | Poor | --- | --- | Fair | Poor | Very poor | Very poor | --- | Very poor | Fair |
| 41 Tubac | Fair | Fair | Fair | --- | --- | Fair | Good | Good | Fair | --- | Good | --- |
| 42*: | | | | | | | | | | | | |
| Tubac (Gravelly loam) | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Tubac (Gravelly sandy loam) | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| 43*: | | | | | | | | | | | | |
| Tubac | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Sonoita | Very poor | Very poor | Poor | --- | --- | Poor | Very poor | Very poor | Very poor | --- | Very poor | Poor |
| 44 Vekol | Good | Good | Good | --- | --- | Poor | Good | Good | Good | --- | Good | Poor |
| 45*: | | | | | | | | | | | | |
| White House | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |
| Forrest | Very poor | Very poor | Fair | --- | --- | Fair | Very poor | Very poor | Very poor | --- | Very poor | Fair |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| 1*: | | | | | | | | | | | |
| Anthony | 0-4 | Sandy loam | SM | A-2, A-4 | 0 | 90-100 | 90-100 | 60-70 | 30-40 | --- | NP |
| | 4-60 | Stratified loam to gravelly sandy loam. | SM | A-1, A-2 | 0 | 85-100 | 60-95 | 35-60 | 15-35 | --- | NP |
| Gila | 0-4 | Loam | ML | A-4 | 0 | 95-100 | 90-100 | 70-80 | 50-60 | 30-40 | NP-10 |
| | 4-60 | Stratified silt loam to gravelly sandy loam. | ML, SM | A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 30-75 | 20-30 | NP-5 |
| 2*: | | | | | | | | | | | |
| Arizo | 0-3 | Fine sandy loam | SM | A-2, A-4 | 0 | 80-100 | 75-95 | 45-85 | 25-45 | --- | NP |
| | 3-60 | Very gravelly loamy sand, very gravelly sand. | GP-GM, GP | A-1 | 0 | 30-40 | 20-30 | 10-20 | 0-10 | --- | NP |
| Arizo | 0-3 | Gravelly sandy loam. | SM, GM | A-2, A-4 | 0 | 70-80 | 65-75 | 45-70 | 25-45 | --- | NP |
| | 3-60 | Very gravelly loamy sand, very gravelly sand. | GP-GM, GP | A-1 | 0 | 30-40 | 20-30 | 10-20 | 0-10 | --- | NP |
| Arizo | 0-3 | Gravelly loamy sand. | SM | A-1 | 0 | 75-85 | 60-70 | 30-50 | 10-20 | --- | NP |
| | 3-60 | Very gravelly loamy sand, very gravelly sand. | GP-GM, GP | A-1 | 0 | 30-40 | 20-30 | 10-20 | 0-10 | --- | NP |
| 3<br>Artesia | 0-3 | Cobbly fine sandy loam. | SM-SC | A-2, A-4 | 15-30 | 70-90 | 60-80 | 50-60 | 30-40 | 20-25 | 5-10 |
| | 3-25 | Very gravelly clay loam, very gravelly clay. | GC | A-2, A-6 | 0-10 | 40-50 | 35-50 | 30-50 | 15-40 | 30-35 | 15-20 |
| | 25 | Cemented | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4*: | | | | | | | | | | | |
| Atascosa | 0-2 | Stony sandy loam | ML | A-4 | 15-40 | 80-90 | 80-85 | 60-70 | 50-60 | 25-35 | NP-10 |
| | 2-7 | Very gravelly sandy clay loam, very gravelly clay loam. | GC | A-2 | 20-30 | 50-60 | 40-50 | 30-45 | 15-30 | 25-35 | 10-15 |
| | 7 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Chiricahua | 0-2 | Gravelly sandy loam. | GM, SM | A-1, A-2 | 0-10 | 55-75 | 50-75 | 35-55 | 15-35 | --- | NP |
| | 2-18 | Gravelly clay, gravelly clay loam. | CH | A-7 | 0-15 | 80-90 | 55-70 | 50-60 | 50-55 | 60-70 | 40-50 |
| | 18-27 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 27 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | | | | | | | | | | | |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| 5*: | | | | | | | | | | | |
| Atascosa | 0-2 | Cobbly loam | ML | A-4 | 15-40 | 80-90 | 80-85 | 60-70 | 50-60 | 25-35 | NP-10 |
| | 2-10 | Very gravelly sandy clay loam, very gravelly clay loam. | GC | A-2 | 20-30 | 50-60 | 40-50 | 30-45 | 15-30 | 25-35 | 10-15 |
| | 10 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Graham | 0-2 | Cobbly clay loam | CH | A-7 | 20-30 | 75-85 | 75-85 | 60-85 | 50-70 | 60-80 | 40-60 |
| | 2-13 | Gravelly clay, gravelly clay loam. | CH | A-7 | 0-20 | 70-90 | 60-75 | 50-70 | 50-70 | 60-80 | 40-60 |
| | 13 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | | | | | | | | | | | |
| 6<br>Bluepoint | 0-2 | Loamy sand | SM | A-2 | 0 | 90-100 | 90-100 | 75-85 | 20-35 | --- | NP |
| | 2-60 | Stratified loamy fine sand to loamy sand. | SM | A-2 | 0 | 90-100 | 90-100 | 70-80 | 15-25 | --- | NP |
| 7*: | | | | | | | | | | | |
| Bluepoint | 0-2 | Loamy sand | SM | A-2 | 0 | 90-100 | 90-100 | 75-85 | 20-35 | --- | NP |
| | 2-60 | Stratified loamy fine sand to loamy sand. | SM | A-2 | 0 | 90-100 | 90-100 | 70-80 | 15-25 | --- | NP |
| Gothard | 0-2 | Fine sandy loam | SM | A-2, A-4 | 0 | 100 | 100 | 60-75 | 30-45 | 15-25 | NP-5 |
| | 2-22 | Clay loam, sandy clay loam. | SC, CL | A-6 | 0 | 100 | 100 | 80-90 | 45-55 | 30-40 | 10-20 |
| | 22-60 | Stratified clay loam to loamy sand. | SM, SM-SC | A-1, A-2 | 0 | 100 | 75-100 | 30-70 | 10-30 | 15-30 | NP-10 |
| 8<br>Bonita | 0-3 | Cobbly silty clay. | CH | A-7 | 10-30 | 90-100 | 80-90 | 80-90 | 80-90 | 55-65 | 40-50 |
| | 3-38 | Silty clay, clay | CH | A-7 | 0-5 | 90-100 | 90-100 | 90-100 | 80-90 | 55-65 | 40-50 |
| | 38-55 | Gravelly clay, very gravelly clay. | GC | A-2, A-7 | 0-5 | 20-65 | 20-65 | 15-65 | 15-50 | 55-65 | 40-50 |
| 9<br>Bucklebar | 0-1 | Fine sandy loam | SM, ML | A-2, A-4 | 0 | 95-100 | 95-100 | 60-85 | 30-55 | <25 | NP-5 |
| | 1-38 | Sandy clay loam, clay loam. | SM-SC, SC, CL-ML, CL | A-6, A-4 | 0-5 | 90-100 | 90-100 | 60-85 | 40-60 | 25-35 | 5-15 |
| | 38-52 | Silty clay loam, loam, sandy loam. | CL-ML, CL | A-4, A-6 | 0-5 | 95-100 | 95-100 | 85-100 | 60-90 | 25-40 | 5-15 |
| 10*: | | | | | | | | | | | |
| Calciorthids. | | | | | | | | | | | |
| Torriorthents. | | | | | | | | | | | |
| 11*: | | | | | | | | | | | |
| Cave | 0-11 | Gravelly loam | SM-SC | A-4 | 0-5 | 70-90 | 60-75 | 40-65 | 35-50 | 25-30 | 5-10 |
| | 11-14 | Indurated | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 14-48 | Gravelly loamy sand, very gravelly sandy loam. | GM, SM | A-1, A-2 | 0-5 | 35-75 | 30-60 | 20-35 | 10-30 | --- | NP |
| Durorthids. | | | | | | | | | | | |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| 12*: | | | | | | | | | | | |
| Comoro------------ | 0-10 | Fine sandy loam | SM, ML | A-4 | 0 | 95-100 | 95-100 | 60-70 | 40-60 | 30-40 | NP-10 |
| | 10-60 | Stratified silt loam to gravelly loamy sand. | GM, SM | A-2, A-4 | 0-5 | 55-100 | 50-75 | 30-70 | 25-40 | 15-25 | NP-5 |
| Comoro------------ | 0-10 | Gravelly sandy loam. | SM, GM | A-1, A-2 | 0-5 | 55-85 | 50-75 | 30-65 | 20-30 | 15-25 | NP-5 |
| | 10-60 | Stratified silt loam to gravelly loamy sand. | GM, SM | A-2, A-4 | 0-5 | 55-100 | 50-75 | 30-70 | 25-40 | 15-25 | NP-5 |
| Comoro------------ | 0-10 | Sandy loam------ | SM | A-2, A-4 | 0 | 95-100 | 95-100 | 60-70 | 30-40 | 30-40 | NP-10 |
| | 10-60 | Stratified silt loam to gravelly loamy sand. | GM, SM | A-2, A-4 | 0-5 | 55-100 | 50-75 | 30-70 | 25-40 | 15-25 | NP-5 |
| 13*: | | | | | | | | | | | |
| Continental------- | 0-4 | Gravelly sandy loam. | SM | A-2 | 0-10 | 70-80 | 50-75 | 40-50 | 25-35 | --- | NP |
| | 4-35 | Clay, gravelly clay, gravelly sandy clay. | CL, SC | A-7 | 0-5 | 80-95 | 50-90 | 50-70 | 35-65 | 40-50 | 20-30 |
| | 35-60 | Gravelly sandy clay loam, gravelly fine sandy loam. | SM-SC | A-2 | 5-15 | 70-80 | 50-75 | 50-60 | 10-30 | 20-30 | 5-10 |
| Tubac------------- | 0-4 | Gravelly sandy loam. | SM, GM | A-2, A-4 | 0-5 | 65-85 | 65-70 | 40-60 | 30-40 | --- | NP |
| | 4-12 | Gravelly loam--- | SC | A-6 | 0-5 | 75-90 | 65-75 | 45-55 | 40-50 | 20-30 | 10-15 |
| | 12-36 | Clay------------ | CH | A-7 | 0 | 95-100 | 90-100 | 80-95 | 70-85 | 60-70 | 30-40 |
| | 36-60 | Clay loam------- | CL | A-7 | 0 | 90-100 | 85-100 | 80-90 | 60-70 | 40-50 | 25-35 |
| 14, 15------------- Dona Ana | 0-3 | Fine sandy loam | SM | A-4, A-2 | 0 | 95-100 | 90-100 | 60-85 | 30-50 | <25 | NP-4 |
| | 3-25 | Loam, sandy clay loam. | ML | A-4, A-6 | 0 | 95-100 | 90-100 | 80-90 | 50-80 | 25-40 | 5-15 |
| | 25-60 | Loam------------ | CL-ML, ML | A-4 | 0 | 95-100 | 90-100 | 80-100 | 60-80 | 25-35 | 5-10 |
| 16----------------- Eba | 0-3 | Gravelly sandy loam. | SM-SC | A-4 | 5-15 | 75-85 | 65-75 | 50-60 | 35-45 | 25-30 | 5-10 |
| | 3-33 | Very gravelly clay. | GC | A-2, A-6, A-7 | 5-15 | 35-60 | 30-55 | 25-55 | 25-50 | 35-50 | 15-30 |
| | 33-56 | Very gravelly clay loam, very gravelly loam. | GC | A-2, A-6 | 5-15 | 35-60 | 30-55 | 25-55 | 20-45 | 30-40 | 10-25 |
| 17----------------- Eba | 0-3 | Gravelly fine sandy loam. | SM-SC | A-4 | 5-15 | 75-85 | 65-75 | 50-60 | 35-45 | 25-30 | 5-10 |
| | 3-33 | Very gravelly clay. | GC | A-2, A-6, A-7 | 5-15 | 35-60 | 30-55 | 25-55 | 25-50 | 35-50 | 15-30 |
| | 33-56 | Very gravelly clay loam, very gravelly loam. | GC | A-2, A-6 | 5-15 | 35-60 | 30-55 | 25-55 | 20-45 | 30-40 | 10-25 |
| 18*: | | | | | | | | | | | |
| Faraway----------- | 0-10 | Very cobbly loam | GM, GM-GC | A-2, A-4, A-1 | 30-55 | 40-65 | 35-60 | 25-50 | 20-40 | 20-30 | NP-10 |
| | 10 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | | | | | | | | | | | |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification |  | Frag-ments > 3 inches | Percentage passing sieve number-- |  |  |  | Liquid limit | Plas-ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Unified | AASHTO |  | 4 | 10 | 40 | 200 |  |  |
|  | In |  |  |  | Pct |  |  |  |  | Pct |  |
| 19*: |  |  |  |  |  |  |  |  |  |  |  |
| Forrest | 0-2 | Gravelly loam | SM, SM-SC, SC | A-4, A-6 | 0-5 | 85-100 | 70-75 | 50-65 | 35-50 | 15-30 | NP-15 |
|  | 2-38 | Clay, gravelly clay. | CH | A-7 | 0-5 | 95-100 | 70-100 | 65-90 | 50-75 | 55-65 | 30-40 |
|  | 38-54 | Gravelly clay loam, loam, clay loam. | SC, CL | A-6 | 0-5 | 85-95 | 70-85 | 60-75 | 40-60 | 25-35 | 10-20 |
| White House | 0-2 | Gravelly loam | CL, SC | A-6 | 0-10 | 80-95 | 70-75 | 50-70 | 40-65 | 25-40 | 15-25 |
|  | 2-28 | Clay, clay loam | CH | A-7 | 0-5 | 90-100 | 80-95 | 70-90 | 60-90 | 50-60 | 30-40 |
|  | 28-50 | Gravelly sandy clay loam, gravelly clay. | SC, GC | A-6, A-2 | 0-10 | 55-75 | 50-70 | 40-50 | 20-40 | 30-40 | 15-25 |
| Kimbrough | 0-14 | Gravelly loam | GM, ML, CL-ML, GM-GC | A-2, A-4, A-1 | 0-10 | 55-80 | 55-75 | 40-70 | 30-55 | 20-30 | NP-10 |
|  | 14 | Indurated | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20<br>Gila | 0-4 | Loam | ML, CL-ML | A-4 | 0 | 95-100 | 95-100 | 80-90 | 60-75 | 20-30 | NP-10 |
|  | 4-60 | Stratified silt loam to gravelly sandy loam. | ML, SM | A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 30-75 | --- | NP |
| 21*: |  |  |  |  |  |  |  |  |  |  |  |
| Gila | 0-4 | Loam | ML, CL-ML | A-4 | 0 | 95-100 | 95-100 | 80-90 | 60-75 | 20-30 | NP-10 |
|  | 4-60 | Stratified silt loam to gravelly sandy loam. | ML, SM | A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 30-75 | --- | NP |
| Anthony | 0-4 | Sandy loam | SM, ML | A-4 | 0 | 95-100 | 90-100 | 55-85 | 35-65 | 20-30 | NP-5 |
|  | 4-60 | Fine sandy loam, sandy loam. | SM | A-2, A-4 | 0 | 95-100 | 90-100 | 50-85 | 30-50 | 20-30 | NP-5 |
| Bluepoint | 0-2 | Loamy sand | SM | A-2 | 0 | 90-100 | 90-100 | 75-85 | 20-35 | --- | NP |
|  | 2-60 | Stratified loamy fine sand to loamy sand. | SM | A-2 | 0 | 90-100 | 90-100 | 70-80 | 15-25 | --- | NP |
| 22*, 23*: |  |  |  |  |  |  |  |  |  |  |  |
| Glendale | 0-2 | Silty clay loam | CL | A-6 | 0 | 100 | 100 | 95-100 | 80-90 | 30-40 | 15-25 |
|  | 2-60 | Silt loam, clay loam, silty clay loam. | CL | A-6 | 0 | 100 | 100 | 95-100 | 75-90 | 30-40 | 15-25 |
| Gila | 0-4 | Loam | ML, CL-ML | A-4 | 0 | 95-100 | 95-100 | 80-90 | 60-75 | 20-30 | NP-10 |
|  | 4-60 | Stratified silt loam to gravelly sandy loam. | ML, SM | A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 30-75 | --- | NP |
| 24*: |  |  |  |  |  |  |  |  |  |  |  |
| Glendale | 0-2 | Silty clay loam | CL | A-6 | 0 | 100 | 100 | 95-100 | 75-90 | 30-40 | 15-25 |
|  | 2-60 | Silty clay loam, silt loam. | CL | A-6 | 0 | 100 | 100 | 95-100 | 75-90 | 30-40 | 15-25 |
| Gila | 0-4 | Loam | ML | A-4 | 0 | 95-100 | 90-100 | 70-80 | 50-60 | 30-40 | NP-10 |
|  | 4-60 | Stratified silt loam to gravelly sandy loam. | ML, SM | A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 30-75 | 20-30 | NP-5 |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification |  | Fragments > 3 inches | Percentage passing sieve number-- |  |  |  | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Unified | AASHTO |  | 4 | 10 | 40 | 200 |  |  |
|  | In |  |  |  | Pct |  |  |  |  | Pct |  |
| 25*: |  |  |  |  |  |  |  |  |  |  |  |
| Graham | 0-2 | Cobbly clay loam | CH | A-7 | 20-30 | 75-85 | 75-85 | 60-85 | 50-70 | 60-80 | 40-60 |
|  | 2-13 | Gravelly clay, gravelly clay loam. | CH | A-7 | 0-10 | 70-90 | 60-75 | 50-70 | 50-70 | 60-80 | 40-60 |
|  | 13 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. |  |  |  |  |  |  |  |  |  |  |  |
| 26<br>Guest | 0-7 | Silty clay loam | CL, CH | A-7 | 0 | 95-100 | 95-100 | 90-100 | 70-90 | 35-45 | 15-20 |
|  | 7-60 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 90-100 | 90-100 | 80-100 | 60-80 | 40-50 | 20-40 |
| 27*: |  |  |  |  |  |  |  |  |  |  |  |
| Guest | 0-7 | Silty clay | CH | A-7 | 0 | 95-100 | 95-100 | 90-100 | 75-95 | 50-60 | 30-40 |
|  | 7-60 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 90-100 | 90-100 | 80-100 | 60-80 | 40-50 | 20-40 |
| Hantz | 0-4 | Silt loam | CL | A-6 | 0-5 | 80-100 | 80-100 | 70-90 | 60-80 | 30-40 | 15-20 |
|  | 4-41 | Silty clay, clay | CH | A-7 | 0-5 | 90-100 | 80-100 | 70-100 | 60-90 | 50-60 | 30-40 |
|  | 41-60 | Gravelly silt loam. | GM-GC, CL-ML | A-4 | 0-5 | 55-75 | 55-75 | 45-70 | 35-60 | 20-30 | 5-10 |
| 28<br>Hondale | 0-12 | Silty clay loam | CL | A-6 | 0 | 100 | 100 | 95-100 | 85-95 | 30-40 | 10-15 |
|  | 12-35 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 100 | 100 | 90-100 | 75-95 | 40-55 | 20-30 |
|  | 35-60 | Clay loam, loam, silty clay loam. | ML | A-4, A-6 | 0 | 100 | 100 | 80-100 | 50-80 | 30-40 | 5-15 |
| 29*: |  |  |  |  |  |  |  |  |  |  |  |
| Hondale | 0-12 | Loam | ML, CL-ML | A-4 | 0 | 100 | 100 | 85-100 | 60-90 | 20-30 | NP-10 |
|  | 12-35 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 100 | 100 | 90-100 | 75-95 | 40-55 | 20-30 |
|  | 35-60 | Clay loam, loam, silty clay loam. | ML | A-4, A-6 | 0 | 100 | 100 | 80-100 | 50-80 | 30-40 | 5-15 |
| Hondale | 0-12 | Fine sandy loam | SM | A-2, A-4 | 0 | 100 | 100 | 50-75 | 20-40 | --- | NP |
|  | 12-35 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 100 | 100 | 90-100 | 75-95 | 40-55 | 20-30 |
|  | 35-60 | Clay loam, loam, silty clay loam. | ML | A-4, A-6 | 0 | 100 | 100 | 80-100 | 50-80 | 30-40 | 5-15 |
| Hondale | 0-12 | Silt loam | ML, CL-ML | A-4 | 0 | 100 | 100 | 85-100 | 60-90 | 20-30 | NP-10 |
|  | 12-35 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 100 | 100 | 90-100 | 75-95 | 40-55 | 20-30 |
|  | 35-60 | Clay loam, loam, silty clay loam. | ML | A-4, A-6 | 0 | 100 | 100 | 80-100 | 50-80 | 30-40 | 5-15 |
| 30<br>Kimbrough | 0-3 | Gravelly fine sandy loam. | GM, SM | A-2, A-4, A-1 | 0-10 | 55-80 | 55-75 | 35-65 | 20-45 | 15-25 | NP-5 |
|  | 3-14 | Gravelly fine sandy loam, loam, gravelly loam. | GM, SM, ML, CL-ML | A-2, A-4, A-1 | 0-10 | 55-90 | 55-85 | 35-80 | 20-65 | 15-30 | NP-10 |
|  | 14 | Indurated | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 31*: |  |  |  |  |  |  |  |  |  |  |  |
| Mabray | 0-12 | Very gravelly loam. | GM-GC, GC | A-1, A-2 | 0-5 | 30-40 | 25-35 | 20-30 | 15-25 | 20-30 | 5-10 |
|  | 12 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. |  |  |  |  |  |  |  |  |  |  |  |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| 32*: | | | | | | | | | | | |
| Mokiak------------ | 0-4 | Cobbly sandy clay loam. | SM-SC, SM | A-2 | 20-35 | 70-80 | 60-75 | 50-60 | 25-35 | 25-35 | 5-10 |
| | 4-26 | Very cobbly sandy clay loam. | GM-GC, GC | A-2 | 50-60 | 30-50 | 25-45 | 20-35 | 10-25 | 25-35 | 5-10 |
| | 26 | Unweathered bedrock. | GM-GC, GC | A-2 | --- | --- | --- | --- | --- | --- | --- |
| Faraway----------- | 0-10 | Very cobbly loam | GM, GM-GC | A-2, A-4, A-1 | 30-55 | 40-65 | 35-60 | 25-50 | 20-40 | 20-30 | NP-10 |
| | 10 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | | | | | | | | | | | |
| 33*: | | | | | | | | | | | |
| Pima-------------- | 0-31 | Silt loam------- | CL-ML | A-4 | 0 | 100 | 100 | 80-90 | 70-80 | 20-30 | 5-10 |
| | 31-60 | Clay loam, silty clay loam, loam. | CL | A-6 | 0 | 95-100 | 95-100 | 85-95 | 70-80 | 30-40 | 10-20 |
| Grabe------------- | 0-24 | Silt loam------- | SM, SM-SC | A-4 | 0-5 | 70-100 | 60-75 | 50-65 | 35-50 | 15-35 | NP-10 |
| | 24-60 | Loam, very fine sandy loam, silt loam. | CL, CL-ML | A-4, A-6 | 0 | 80-100 | 75-100 | 65-90 | 55-70 | 20-30 | 5-15 |
| 34*: | | | | | | | | | | | |
| Pima-------------- | 0-8 | Silt loam------- | ML, CL-ML | A-4 | 0 | 100 | 100 | 80-90 | 70-80 | 20-30 | NP-10 |
| | 8-60 | Stratified silt loam to silty clay loam. | CL | A-6 | 0 | 95-100 | 95-100 | 85-95 | 70-85 | 30-40 | 10-20 |
| Grabe------------- | 0-40 | Gravelly loam--- | SM | A-4 | 0 | 85-100 | 60-75 | 50-65 | 35-50 | 25-35 | NP-10 |
| | 40-60 | Gravelly loamy sand. | SM, GM | A-1 | 0 | 60-75 | 60-75 | 15-30 | 10-25 | --- | NP |
| 35----------------- Pridham | 0-1 | Silty clay loam | ML, CL | A-6 | 0 | 100 | 100 | 90-95 | 80-90 | 35-40 | 10-15 |
| | 1-29 | Clay, clay loam, silty clay. | CH | A-7 | 0 | 100 | 100 | 90-100 | 75-95 | 50-60 | 30-40 |
| | 29-60 | Clay loam, clay, sandy clay loam. | CL | A-6 | 0 | 100 | 100 | 90-100 | 70-80 | 30-40 | 15-25 |
| 36*: | | | | | | | | | | | |
| Santo Tomas------- | 0-2 | Cobbly fine sandy loam. | SM | A-1, A-2 | 25-35 | 70-80 | 65-75 | 40-50 | 20-30 | 15-25 | NP-5 |
| | 2-60 | Very gravelly fine sandy loam, very gravelly sandy loam. | GM | A-1 | 15-30 | 40-50 | 25-50 | 15-30 | 10-20 | 15-25 | NP-5 |
| Santo Tomas------- | 0-2 | Very gravelly loam. | SM-SC | A-2 | 10-25 | 65-80 | 35-50 | 30-40 | 20-35 | 20-30 | 5-10 |
| | 2-60 | Very gravelly fine sandy loam, very gravelly sandy loam. | GM | A-1 | 15-30 | 40-50 | 25-50 | 15-30 | 10-20 | 15-25 | NP-5 |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification |  | Fragments > 3 inches | Percentage passing sieve number-- |  |  |  | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Unified | AASHTO |  | 4 | 10 | 40 | 200 |  |  |
|  | In |  |  |  | Pct |  |  |  |  | Pct |  |
| 37-----------------<br>Signal | 0-2 | Gravelly loam--- | GM | A-4 | 0-10 | 55-65 | 50-60 | 45-55 | 30-50 | 25-35 | 5-10 |
|  | 2-32 | Very gravelly clay, very gravelly clay loam, very gravelly sandy clay. | GC | A-2, A-7 | 0-15 | 30-60 | 25-55 | 20-55 | 10-45 | 40-60 | 20-30 |
|  | 32-60 | Very gravelly sandy loam, very gravelly loamy sand, very gravelly sandy clay loam. | GP-GM, GM | A-1 | 10-20 | 30-45 | 25-40 | 15-35 | 5-25 | 15-25 | NP-5 |
| 38-----------------<br>Sonoita | 0-3 | Gravelly sandy loam. | SM-SC | A-1, A-2 | 0-5 | 70-75 | 65-75 | 40-60 | 20-30 | 15-25 | 5-10 |
|  | 3-43 | Gravelly sandy loam, fine sandy loam, sandy loam. | SC | A-1, A-2 | 0-5 | 70-95 | 65-95 | 40-65 | 20-35 | 20-30 | 10-15 |
|  | 43-60 | Gravelly sandy clay loam. | SC | A-2, A-4 | 0-5 | 70-80 | 65-75 | 30-60 | 20-50 | 20-30 | 10-15 |
| 39-----------------<br>Sonoita | 0-5 | Fine sandy loam | SM-SC | A-2, A-4 | 0-5 | 80-100 | 75-95 | 50-75 | 25-45 | 15-25 | 5-10 |
|  | 5-60 | Gravelly sandy loam, fine sandy loam, sandy loam. | SC | A-1, A-2 | 0-5 | 70-95 | 65-95 | 40-65 | 20-35 | 20-30 | 10-15 |
| 40-----------------<br>Tres Hermanos | 0-3 | Gravelly loam--- | SM, ML, SM-SC, CL-ML | A-2, A-4 | 0-5 | 65-90 | 60-75 | 50-70 | 30-60 | <30 | NP-10 |
|  | 3-19 | Gravelly loam, gravelly clay loam, clay loam. | SC, CL | A-6, A-7 | 0-5 | 75-100 | 60-100 | 50-90 | 40-75 | 30-45 | 10-20 |
|  | 19-60 | Gravelly loam, gravelly sandy clay loam, gravelly sandy loam. | SM | A-1, A-2, A-4 | 0-10 | 65-95 | 60-75 | 40-65 | 20-50 | <30 | NP-5 |
| 41-----------------<br>Tubac | 0-10 | Sandy clay loam | SC | A-6 | 0 | 90-100 | 85-95 | 75-85 | 35-50 | 30-40 | 15-25 |
|  | 10-36 | Clay, clay loam | CH | A-7 | 0 | 95-100 | 90-100 | 80-95 | 70-85 | 60-70 | 35-45 |
|  | 36-60 | Gravelly sandy clay loam, clay loam. | SC, CL | A-2, A-6 | 0-5 | 75-100 | 60-100 | 50-85 | 40-75 | 30-40 | 10-20 |
| 42*: |  |  |  |  |  |  |  |  |  |  |  |
| Tubac------------- | 0-7 | Gravelly loam--- | SM | A-2 | 0-5 | 60-80 | 50-75 | 40-60 | 35-50 | 20-30 | NP-5 |
|  | 7-37 | Clay, clay loam | CH | A-7 | 0 | 95-100 | 90-100 | 80-95 | 70-85 | 60-70 | 35-45 |
|  | 37-60 | Gravelly sandy clay loam, clay loam. | SC, CL | A-2, A-6 | 0-5 | 75-100 | 60-100 | 50-85 | 40-75 | 30-40 | 10-20 |
| Tubac------------- | 0-6 | Gravelly sandy loam. | SM | A-2 | 0-5 | 60-80 | 50-75 | 40-60 | 35-50 | 20-30 | NP-5 |
|  | 6-36 | Clay, clay loam | CH | A-7 | 0 | 95-100 | 90-100 | 80-95 | 70-85 | 60-70 | 35-45 |
|  | 36-60 | Gravelly sandy clay loam, clay loam. | SC, CL | A-2, A-6 | 0-5 | 75-100 | 60-100 | 50-85 | 40-75 | 30-40 | 10-20 |
| 43*: |  |  |  |  |  |  |  |  |  |  |  |
| Tubac------------- | 0-8 | Sandy loam------ | CL | A-6 | 0-5 | 80-100 | 75-100 | 60-90 | 50-70 | 25-35 | 10-15 |
|  | 8-38 | Clay, clay loam | CH | A-7 | 0 | 95-100 | 90-100 | 80-95 | 70-85 | 60-70 | 35-45 |
|  | 38-60 | Gravelly sandy clay loam, clay loam. | SC, CL | A-2, A-6 | 0-5 | 75-100 | 60-100 | 50-85 | 40-75 | 30-40 | 10-20 |

See footnote at end of table.

TABLE 16.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| 43*: | | | | | | | | | | | |
| Sonoita | 0-4 | Sandy loam | SM-SC | A-2 | 0-5 | 80-100 | 75-95 | 50-70 | 25-35 | 15-25 | 5-10 |
| | 4-34 | Gravelly sandy loam, fine sandy loam, sandy loam. | SC | A-1, A-2 | 0-5 | 70-95 | 65-95 | 40-65 | 20-35 | 20-30 | 10-15 |
| | 34-60 | Gravelly sandy clay loam. | SC | A-2, A-4 | 0-5 | 70-80 | 65-75 | 30-60 | 20-50 | 20-30 | 10-15 |
| 44 Vekol | 0-10 | Loam | ML, CL-ML, CL | A-4 | 0 | 100 | 95-100 | 80-90 | 60-70 | 25-35 | 5-10 |
| | 10-47 | Clay, clay loam, silty clay. | CL, CH | A-7 | 0 | 100 | 95-100 | 90-95 | 70-90 | 45-55 | 20-30 |
| | 47-54 | Gravelly sandy loam, gravelly sandy clay loam. | GM, GM-GC, GC, SM | A-1, A-2 | 0 | 55-65 | 50-60 | 30-40 | 15-25 | 15-25 | NP-10 |
| 45*: | | | | | | | | | | | |
| White House | 0-2 | Gravelly loam | CL, SC | A-6 | 0-10 | 80-95 | 70-75 | 50-70 | 40-65 | 25-40 | 15-25 |
| | 2-28 | Clay, clay loam | CH | A-7 | 0-5 | 90-100 | 80-95 | 70-90 | 60-90 | 50-60 | 30-40 |
| | 28-50 | Gravelly sandy clay loam, gravelly clay. | SC, GC | A-6, A-2 | 0-10 | 55-75 | 50-70 | 40-50 | 20-40 | 30-40 | 15-25 |
| Forrest | 0-2 | Sandy loam | ML, CL, CL-ML | A-4, A-6 | 0-5 | 85-100 | 75-85 | 65-75 | 50-60 | 15-30 | NP-15 |
| | 2-38 | Clay, gravelly clay. | CH | A-7 | 0-5 | 95-100 | 70-100 | 65-90 | 50-75 | 55-65 | 30-40 |
| | 38-54 | Gravelly clay loam, loam, clay loam. | SC, CL | A-6 | 0-5 | 85-95 | 70-85 | 60-75 | 40-60 | 25-35 | 10-20 |

* See description of the map unit for composition and behavior characteristics of the map unit.

## TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

| Soil name and map symbol | Depth | Clay <2mm | Moist bulk density | Permeability | Available water capacity | Soil reaction | Salinity | Shrink-swell potential | Erosion factors | | Wind erodibility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | K | T | | |
| | In | Pct | G/cm3 | In/hr | In/in | pH | Mmhos/cm | | | | | Pct |
| 1*: | | | | | | | | | | | | |
| Anthony | 0-4 | 8-12 | 1.65-1.70 | 2.0-6.0 | 0.07-0.13 | 7.9-8.4 | <4 | Low | 0.20 | 5 | 3 | .2-.6 |
| | 4-60 | 8-12 | 1.65-1.70 | 2.0-6.0 | 0.07-0.13 | 7.9-8.4 | <4 | Low | 0.20 | | | |
| Gila | 0-4 | 10-20 | 1.50-1.60 | 0.6-2.0 | 0.13-0.18 | 7.9-8.4 | <4 | Low | 0.49 | 5 | 4L | .5-1 |
| | 4-60 | 10-25 | 1.30-1.60 | 0.6-2.0 | 0.18-0.20 | 7.9-8.4 | <4 | Low | 0.32 | | | |
| 2*: | | | | | | | | | | | | |
| Arizo (Fine sandy loam) | 0-3 | 8-12 | --- | 0.6-2.0 | 0.12-0.15 | 7.4-9.0 | <2 | Low | 0.37 | 5 | 3 | --- |
| | 3-60 | 2-8 | --- | >20 | 0.01-0.04 | 7.4-9.0 | <2 | Low | 0.10 | | | |
| Arizo (Gravelly sandy loam) | 0-3 | 8-12 | --- | 0.6-2.0 | 0.12-0.14 | 7.4-9.0 | <2 | Low | 0.37 | 5 | 3 | --- |
| | 3-60 | 2-8 | --- | >20 | 0.01-0.04 | 7.4-9.0 | <2 | Low | 0.10 | | | |
| Arizo (Gravelly loamy sand) | 0-3 | 5-8 | --- | 6.0-20 | 0.03-0.06 | 7.4-9.0 | <2 | Low | 0.20 | 5 | 2 | --- |
| | 3-60 | 2-8 | --- | >20 | 0.01-0.04 | 7.4-9.0 | <2 | Low | 0.10 | | | |
| 3 | 0-3 | 10-15 | --- | 0.6-2.0 | 0.08-0.10 | 6.6-7.3 | <2 | Low | 0.17 | 2 | 3 | --- |
| Artesia | 3-25 | 35-45 | --- | 0.2-0.6 | 0.08-0.10 | 7.4-8.4 | <2 | Moderate | 0.24 | | | |
| | 25 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| 4*: | | | | | | | | | | | | |
| Atascosa | 0-2 | 10-20 | --- | 0.6-2.0 | 0.08-0.14 | 6.1-7.8 | <2 | Low | 0.32 | 1 | 8 | --- |
| | 2-7 | 25-30 | --- | 0.6-2.0 | 0.08-0.11 | 7.4-7.8 | <2 | Low | 0.28 | | | |
| | 7 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| Chiricahua | 0-2 | 10-15 | 1.45-1.55 | 2.0-6.0 | 0.08-0.10 | 5.6-7.3 | <2 | Low | 0.20 | 1 | 8 | --- |
| | 2-18 | 35-45 | 1.20-1.30 | 0.06-0.2 | 0.08-0.10 | 6.1-7.8 | <2 | High | 0.24 | | | |
| | 18-27 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| | 27 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| Rock outcrop. | | | | | | | | | | | | |
| 5*: | | | | | | | | | | | | |
| Atascosa | 0-2 | 10-20 | --- | 0.6-2.0 | 0.08-0.14 | 6.1-7.8 | <2 | Low | 0.32 | 1 | 8 | --- |
| | 2-10 | 25-30 | --- | 0.6-2.0 | 0.08-0.11 | 7.4-7.8 | <2 | Low | 0.28 | | | |
| | 10 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| Graham | 0-2 | 35-55 | 1.20-1.30 | 0.06-0.2 | 0.10-0.14 | 6.6-7.8 | <2 | High | 0.20 | 1 | 4 | --- |
| | 2-13 | 35-55 | 1.20-1.30 | 0.06-0.2 | 0.10-0.14 | 7.4-8.4 | <2 | High | 0.20 | | | |
| | 13 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| Rock outcrop. | | | | | | | | | | | | |
| 6 | 0-2 | 5-8 | --- | 6.0-20 | 0.06-0.10 | 7.9-9.0 | <8 | Low | 0.15 | 5 | 2 | --- |
| Bluepoint | 2-60 | 5-8 | --- | 6.0-20 | 0.06-0.10 | 7.9-9.0 | <8 | Low | 0.15 | | | |
| 7*: | | | | | | | | | | | | |
| Bluepoint | 0-2 | 5-8 | --- | 6.0-20 | 0.06-0.10 | 7.9-9.0 | <8 | Low | 0.15 | 5 | 2 | --- |
| | 2-60 | 5-8 | --- | 6.0-20 | 0.06-0.10 | 7.9-9.0 | <8 | Low | 0.15 | | | |
| Gothard | 0-2 | 8-12 | 1.50-1.60 | 0.6-2.0 | 0.07-0.09 | >7.8 | >8 | Low | 0.28 | 5 | 3 | .5-1 |
| | 2-22 | 30-35 | 1.25-1.35 | 0.06-0.2 | 0.05-0.10 | >8.4 | >8 | Moderate | 0.43 | | | |
| | 22-60 | 5-35 | 1.20-1.65 | 0.06-2.0 | 0.02-0.08 | >8.4 | >8 | Low | 0.17 | | | |
| 8 | 0-3 | 40-50 | 1.25-1.30 | <0.06 | 0.14-0.17 | 7.9-8.4 | <2 | High | 0.28 | 3 | 8 | --- |
| Bonita | 3-38 | 40-50 | 1.25-1.30 | <0.06 | 0.11-0.13 | 7.9-8.4 | <2 | High | 0.28 | | | |
| | 38-55 | 35-50 | 1.25-1.30 | <0.06 | 0.14-0.16 | 7.9-8.4 | <2 | High | 0.28 | | | |
| 9 | 0-1 | 10-18 | --- | 2.0-6.0 | 0.08-0.13 | 7.4-8.4 | <2 | Low | 0.24 | 5 | 3 | .5-1 |
| Bucklebar | 1-38 | 20-35 | --- | 0.6-2.0 | 0.13-0.17 | 7.4-8.4 | <2 | Moderate | 0.32 | | | |
| | 38-52 | 20-35 | --- | 0.6-2.0 | 0.13-0.19 | 7.9-8.4 | <2 | Moderate | 0.37 | | | |

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Clay <2mm | Moist bulk density | Permeability | Available water capacity | Soil reaction | Salinity | Shrink-swell potential | Erosion factors | | Wind erodibility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | K | T | | |
| | In | Pct | $G/cm^3$ | In/hr | In/in | pH | Mmhos/cm | | | | | Pct |
| 10*: | | | | | | | | | | | | |
| Calciorthids. | | | | | | | | | | | | |
| Torriorthents. | | | | | | | | | | | | |
| 11*: | | | | | | | | | | | | |
| Cave------------ | 0-11 | 8-14 | 1.20-1.40 | 0.6-2.0 | 0.07-0.12 | 7.9-8.4 | 2-4 | Low-------- | 0.28 | 1 | 4L | --- |
| | 11-14 | --- | --- | --- | --- | --- | --- | ----------- | ---- | | | |
| | 14-48 | 2-5 | 1.50-1.60 | 2.0-6.0 | 0.04-0.06 | 7.9-8.4 | >4 | Low-------- | 0.15 | | | |
| Durorthids. | | | | | | | | | | | | |
| 12*: | | | | | | | | | | | | |
| Comoro---------- | 0-10 | 8-15 | 1.60-1.65 | 2.0-6.0 | 0.11-0.15 | 6.6-8.4 | <2 | Low-------- | 0.20 | 5 | 3 | 1-2 |
| (Fine sandy loam) | 10-60 | 8-15 | 1.60-1.65 | 2.0-6.0 | 0.07-0.09 | 6.6-8.4 | <2 | Low-------- | 0.15 | | | |
| Comoro---------- | 0-10 | 8-15 | 1.60-1.65 | 2.0-6.0 | 0.07-0.09 | 6.6-8.4 | <2 | Low-------- | 0.15 | 5 | 3 | 1-2 |
| (Gravelly sandy loam) | 10-60 | 8-15 | 1.60-1.65 | 2.0-6.0 | 0.07-0.09 | 6.6-8.4 | <2 | Low-------- | 0.15 | | | |
| Comoro---------- | 0-10 | 8-15 | 1.60-1.65 | 2.0-6.0 | 0.11-0.15 | 6.6-8.4 | <2 | Low-------- | 0.20 | 5 | 3 | 1-2 |
| (Sandy loam) | 10-60 | 8-15 | 1.60-1.65 | 2.0-6.0 | 0.07-0.09 | 6.6-8.4 | <2 | Low-------- | 0.15 | | | |
| 13*: | | | | | | | | | | | | |
| Continental----- | 0-4 | 10-18 | 1.50-1.60 | 2.0-6.0 | 0.07-0.09 | 6.1-7.3 | <2 | Low-------- | 0.20 | 5 | 3 | .5-1 |
| | 4-35 | 40-50 | 1.25-1.35 | 0.06-0.2 | 0.10-0.16 | 6.6-8.4 | <2 | High------ | 0.28 | | | |
| | 35-60 | 15-35 | 1.30-1.40 | 0.2-0.6 | 0.09-0.11 | 7.4-8.4 | <2 | Low-------- | 0.32 | | | |
| Tubac------------ | 0-4 | 8-15 | 1.35-1.55 | 2.0-6.0 | 0.08-0.10 | 6.6-7.3 | <2 | Low-------- | 0.15 | 5 | 5 | .5-1 |
| | 4-12 | 18-25 | 1.35-1.55 | 0.6-2.0 | 0.12-0.14 | 6.6-7.3 | <2 | Moderate | 0.37 | | | |
| | 12-36 | 40-55 | 1.20-1.35 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | <2 | High------ | 0.28 | | | |
| | 36-60 | 28-35 | 1.30-1.40 | 0.2-0.6 | 0.19-0.21 | 7.9-8.4 | <2 | Moderate | 0.28 | | | |
| 14, 15----------- | 0-3 | 10-18 | --- | 2.0-6.0 | 0.10-0.13 | 7.4-7.8 | <2 | Low-------- | 0.24 | 5 | 3 | .5-1 |
| Dona Ana | 3-25 | 20-35 | --- | 0.6-2.0 | 0.13-0.17 | 7.9-8.4 | 2-4 | Moderate | 0.32 | | | |
| | 25-60 | 20-27 | --- | 0.6-2.0 | 0.13-0.17 | 7.9-8.4 | 2-4 | Low-------- | 0.37 | | | |
| 16, 17----------- | 0-3 | 5-15 | --- | 0.6-2.0 | 0.07-0.09 | 6.6-7.8 | <2 | Low-------- | 0.17 | 3 | 7 | .5-1 |
| Eba | 3-33 | 40-55 | --- | 0.06-0.2 | 0.07-0.09 | 7.4-8.4 | 2-4 | Moderate | 0.17 | | | |
| | 33-56 | 35-40 | --- | 0.2-0.6 | 0.07-0.09 | 7.9-8.4 | 2-4 | Low-------- | 0.17 | | | |
| 18*: | | | | | | | | | | | | |
| Faraway--------- | 0-10 | 10-20 | 1.30-1.45 | 0.6-2.0 | 0.03-0.07 | 5.6-7.3 | <2 | Low-------- | 0.32 | 1 | 8 | --- |
| | 10 | --- | --- | --- | --- | --- | --- | ----------- | ---- | | | |
| Rock outcrop. | | | | | | | | | | | | |
| 19*: | | | | | | | | | | | | |
| Forrest--------- | 0-2 | 10-20 | 1.40-1.65 | 0.6-2.0 | 0.07-0.14 | 5.6-7.3 | <2 | Low-------- | 0.37 | 5 | 3 | 1-2 |
| | 2-38 | 40-50 | 1.50-1.60 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | <2 | High------ | 0.28 | | | |
| | 38-54 | 25-35 | 1.40-1.55 | 0.2-0.6 | 0.10-0.16 | 7.4-9.0 | 2-4 | Moderate | 0.32 | | | |
| White House----- | 0-2 | 20-30 | 1.30-1.40 | 0.6-2.0 | 0.12-0.19 | 5.6-6.5 | <2 | Moderate | 0.37 | 5 | 6 | 1-2 |
| | 2-28 | 35-60 | 1.20-1.30 | 0.06-0.2 | 0.14-0.16 | 6.6-8.4 | <2 | High------ | 0.32 | | | |
| | 28-50 | 30-45 | 1.30-1.40 | 0.2-0.6 | 0.10-0.14 | 7.9-8.4 | <2 | Moderate | 0.37 | | | |
| Kimbrough------- | 0-14 | 15-25 | --- | 0.6-2.0 | 0.11-0.15 | 7.4-8.4 | <2 | Low-------- | 0.28 | 1 | 5 | 1-3 |
| | 14 | --- | --- | --- | --- | --- | --- | ----------- | ---- | | | |
| 20--------------- | 0-4 | 12-18 | --- | 0.6-2.0 | 0.16-0.18 | 7.9-8.4 | <4 | Low-------- | 0.37 | 5 | 4L | .5-1 |
| Gila | 4-60 | 8-18 | --- | 0.6-2.0 | 0.17-0.19 | 7.9-8.4 | <4 | Low-------- | 0.49 | | | |
| 21*: | | | | | | | | | | | | |
| Gila------------ | 0-4 | 12-18 | --- | 0.6-2.0 | 0.16-0.18 | 7.9-8.4 | <4 | Low-------- | 0.37 | 5 | 4L | .5-1 |
| | 4-60 | 8-18 | --- | 0.6-2.0 | 0.17-0.19 | 7.9-8.4 | <4 | Low-------- | 0.49 | | | |
| Anthony--------- | 0-4 | 5-20 | --- | 2.0-6.0 | 0.11-0.14 | 7.9-8.4 | <4 | Low-------- | 0.24 | 5 | 3 | .2-.6 |
| | 4-60 | 5-18 | --- | 2.0-6.0 | 0.10-0.13 | 7.9-8.4 | <4 | Low-------- | 0.20 | | | |

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Clay <2mm | Moist bulk density | Permea- bility | Available water capacity | Soil reaction | Salinity | Shrink- swell potential | Erosion factors | | Wind erodi- bility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | K | T | | |
| | In | Pct | G/cm$^3$ | In/hr | In/in | pH | Mmhos/cm | | | | | Pct |
| 21*: | | | | | | | | | | | | |
| Bluepoint------- | 0-2 | 5-8 | --- | 6.0-20 | 0.06-0.10 | 7.9-9.0 | <8 | Low------- | 0.15 | 5 | 2 | --- |
| | 2-60 | 5-8 | --- | 6.0-20 | 0.06-0.10 | 7.9-9.0 | <8 | Low------- | 0.15 | | | |
| 22*, 23*: | | | | | | | | | | | | |
| Glendale-------- | 0-2 | 25-35 | 1.40-1.50 | 0.2-0.6 | 0.16-0.21 | 7.9-8.4 | 2-4 | Moderate | 0.37 | 5 | 4L | .5-1 |
| | 2-60 | 25-35 | 1.40-1.50 | 0.2-0.6 | 0.16-0.21 | 7.9-8.4 | 2-4 | Moderate | ---- | | | |
| Gila------------ | 0-4 | 12-18 | --- | 0.6-2.0 | 0.16-0.18 | 7.9-8.4 | <4 | Low------- | 0.37 | 5 | 4L | .5-1 |
| | 4-60 | 8-18 | --- | 0.6-2.0 | 0.17-0.19 | 7.9-8.4 | <4 | Low------- | 0.49 | | | |
| 24*: | | | | | | | | | | | | |
| Glendale-------- | 0-2 | 30-35 | 1.25-1.35 | 0.2-0.6 | 0.16-0.21 | 7.9-8.4 | 2-4 | Moderate | 0.37 | 5 | 4L | .5-1 |
| | 2-60 | 25-35 | 1.25-1.35 | 0.2-0.6 | 0.16-0.21 | 7.9-8.4 | 2-4 | Moderate | 0.28 | | | |
| Gila------------ | 0-4 | 10-20 | 1.50-1.60 | 0.6-2.0 | 0.13-0.18 | 7.9-8.4 | <4 | Low------- | 0.49 | 5 | 4L | .5-1 |
| | 4-60 | 10-25 | 1.30-1.60 | 0.6-2.0 | 0.18-0.20 | 7.9-8.4 | <4 | Low------- | 0.32 | | | |
| 25*: | | | | | | | | | | | | |
| Graham---------- | 0-2 | 35-55 | 1.20-1.30 | 0.06-0.2 | 0.10-0.14 | 6.6-7.8 | <2 | High------ | 0.20 | 1 | 4 | --- |
| | 2-13 | 35-55 | 1.20-1.30 | 0.06-0.2 | 0.10-0.14 | 7.4-8.4 | <2 | High------ | 0.20 | | | |
| | 13 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| Rock outcrop. | | | | | | | | | | | | |
| 26--------------- Guest | 0-7 | 35-40 | 1.35-1.45 | 0.06-0.6 | 0.16-0.19 | 7.9-9.0 | 2-4 | High------ | 0.37 | 5 | 4 | .5-1 |
| | 7-60 | 35-50 | 1.35-1.45 | 0.06-0.2 | 0.14-0.19 | 7.9-9.0 | 2-4 | High------ | 0.28 | | | |
| 27*: | | | | | | | | | | | | |
| Guest----------- | 0-7 | 40-50 | 1.25-1.35 | 0.06-0.2 | 0.14-0.16 | 7.9-9.0 | 2-4 | High------ | 0.28 | 5 | 4 | .5-1 |
| | 7-60 | 35-50 | 1.35-1.45 | 0.06-0.2 | 0.14-0.19 | 7.9-9.0 | 2-4 | High------ | 0.28 | | | |
| Hantz----------- | 0-4 | 25-35 | 1.30-1.40 | 0.2-2.0 | 0.19-0.21 | 7.9-9.0 | 2-4 | Moderate | 0.37 | 5 | 4L | .5-1 |
| | 4-41 | 40-50 | 1.35-1.45 | <0.06 | 0.14-0.16 | 7.9-9.0 | 2-4 | High------ | 0.24 | | | |
| | 41-60 | 18-27 | 1.30-1.40 | 0.6-2.0 | 0.08-0.12 | 7.9-9.0 | 2-4 | Low------- | 0.24 | | | |
| 28--------------- Hondale | 0-12 | 30-35 | --- | 0.2-0.6 | 0.10-0.15 | 7.9-9.0 | 4-16 | Moderate | 0.37 | 5 | 4L | .5-1 |
| | 12-35 | 35-45 | --- | <0.06 | 0.08-0.15 | >8.4 | 4-16 | High------ | 0.37 | | | |
| | 35-60 | 20-30 | --- | 0.2-0.6 | 0.08-0.15 | >8.4 | 4-16 | Moderate | 0.37 | | | |
| 29*: | | | | | | | | | | | | |
| Hondale--------- (Loam) | 0-12 | 15-20 | --- | 0.6-2.0 | 0.07-0.13 | 7.9-9.0 | 4-16 | Low------- | 0.43 | 5 | 4L | .5-1 |
| | 12-35 | 35-45 | --- | <0.06 | 0.08-0.15 | >8.4 | 4-16 | High------ | 0.37 | | | |
| | 35-60 | 20-30 | --- | 0.2-0.6 | 0.08-0.15 | >8.4 | 4-16 | Moderate | 0.37 | | | |
| Hondale--------- (Fine sandy loam) | 0-12 | 5-10 | --- | 2.0-6.0 | 0.04-0.08 | 7.9-9.0 | 4-16 | Low------- | 0.24 | 5 | 2 | .5-1 |
| | 12-35 | 35-45 | --- | <0.06 | 0.08-0.15 | >8.4 | 4-16 | High------ | 0.37 | | | |
| | 35-60 | 20-30 | --- | 0.2-0.6 | 0.08-0.15 | >8.4 | 4-16 | Moderate | 0.37 | | | |
| Hondale--------- (Silt loam) | 0-12 | 15-20 | --- | 0.6-2.0 | 0.07-0.13 | 7.9-9.0 | 4-16 | Low------- | 0.43 | 5 | 4L | .5-1 |
| | 12-35 | 35-45 | --- | <0.06 | 0.08-0.15 | >8.4 | 4-16 | High------ | 0.37 | | | |
| | 35-60 | 20-30 | --- | 0.2-0.6 | 0.08-0.15 | >8.4 | 4-16 | Moderate | 0.37 | | | |
| 30--------------- Kimbrough | 0-3 | 10-15 | --- | 0.6-2.0 | 0.10-0.13 | 7.4-8.4 | <2 | Low------- | 0.28 | 1 | 4 | 1-3 |
| | 3-14 | 10-25 | --- | 0.6-2.0 | 0.10-0.17 | 7.4-8.4 | <2 | Low------- | 0.28 | | | |
| | 14 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| 31*: | | | | | | | | | | | | |
| Mabray---------- | 0-12 | 15-25 | 1.20-1.35 | 0.6-2.0 | 0.04-0.07 | 7.9-8.4 | <2 | Low------- | 0.32 | 1 | 8 | --- |
| | 12 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |
| Rock outcrop. | | | | | | | | | | | | |
| 32*: | | | | | | | | | | | | |
| Mokiak---------- | 0-4 | 20-30 | --- | 2.0-6.0 | 0.06-0.08 | 7.4-7.8 | <2 | Low------- | 0.28 | 2 | 8 | 1-2 |
| | 4-26 | 20-30 | --- | 0.6-2.0 | 0.07-0.09 | 7.4-7.8 | <2 | Low------- | 0.15 | | | |
| | 26 | --- | --- | --- | --- | --- | --- | ---------- | ---- | | | |

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Clay <2mm | Moist bulk density | Permeability | Available water capacity | Soil reaction | Salinity | Shrink-swell potential | Erosion factors | | Wind erodibility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | K | T | | |
| | In | Pct | G/cm$^3$ | In/hr | In/In | pH | Mmhos/cm | | | | | Pct |
| 32*: | | | | | | | | | | | | |
| Faraway | 0-10 | 10-20 | 1.30-1.45 | 0.6-2.0 | 0.03-0.07 | 5.6-7.3 | <2 | Low | 0.32 | 1 | 8 | --- |
| | 10 | --- | --- | --- | --- | --- | --- | --- | --- | | | |
| Rock outcrop. | | | | | | | | | | | | |
| 33*: | | | | | | | | | | | | |
| Pima | 0-31 | 15-25 | 1.50-1.60 | 0.6-2.0 | 0.16-0.21 | 7.4-8.4 | <2 | Low | 0.37 | 5 | 4L | 1-2 |
| | 31-60 | 25-30 | 1.20-1.35 | 0.2-0.6 | 0.19-0.21 | 7.4-8.4 | <4 | Moderate | 0.32 | | | |
| Grabe | 0-24 | 10-18 | 1.30-1.55 | 0.6-2.0 | 0.08-0.15 | 7.4-8.4 | 2-4 | Low | 0.24 | 5 | 4L | 1-2 |
| | 24-60 | 15-18 | 1.30-1.40 | 0.6-2.0 | 0.12-0.21 | 7.4-8.4 | 2-4 | Low | 0.49 | | | |
| 34*: | | | | | | | | | | | | |
| Pima | 0-8 | 15-25 | 1.50-1.60 | 0.6-2.0 | 0.16-0.21 | 7.4-8.4 | <2 | Low | 0.37 | 5 | 4L | 1-2 |
| | 8-60 | 25-30 | 1.20-1.35 | 0.2-0.6 | 0.19-0.21 | 7.4-8.4 | <4 | Moderate | 0.32 | | | |
| Grabe | 0-40 | 18-22 | 1.30-1.35 | 0.6-2.0 | 0.12-0.15 | 7.9-8.4 | 2-4 | Low | 0.32 | 5 | 4L | 1-2 |
| | 40-60 | 5-10 | 1.25-1.35 | 2.0-6.0 | 0.08-0.10 | 7.9-8.4 | 2-4 | Low | 0.37 | | | |
| 35 | 0-1 | 30-35 | --- | 0.2-0.6 | 0.19-0.21 | 6.6-9.0 | <2 | Moderate | 0.37 | 5 | 4 | --- |
| Pridham | 1-29 | 35-55 | --- | 0.06-0.2 | 0.14-0.16 | 7.9-9.0 | 4-16 | High | 0.24 | | | |
| | 29-60 | 25-45 | --- | 0.2-0.6 | 0.19-0.21 | 7.9-9.0 | 4-16 | Moderate | 0.37 | | | |
| 36*: | | | | | | | | | | | | |
| Santo Tomas (Cobbly fine sandy loam) | 0-2 | 10-15 | --- | 2.0-6.0 | 0.07-0.10 | 6.6-8.4 | <2 | Low | 0.24 | 5 | --- | --- |
| | 2-60 | 10-15 | --- | 2.0-6.0 | 0.04-0.06 | 7.4-8.4 | <2 | Low | 0.20 | | | |
| Santo Tomas (Very gravelly loam) | 0-2 | 10-20 | --- | 2.0-6.0 | 0.07-0.10 | 6.6-8.4 | <2 | Low | 0.24 | 5 | --- | --- |
| | 2-60 | 10-15 | --- | 0.6-2.0 | 0.04-0.06 | 7.4-8.4 | <2 | Low | 0.20 | | | |
| 37 | 0-2 | 18-25 | --- | 0.6-2.0 | 0.10-0.14 | 6.6-7.3 | <2 | Low | 0.37 | 5 | 5 | --- |
| Signal | 2-32 | 35-55 | --- | 0.06-0.2 | 0.07-0.12 | 6.6-8.4 | <2 | Moderate | 0.32 | | | |
| | 32-60 | 5-25 | --- | 6.0-20 | 0.02-0.08 | 7.9-8.4 | <2 | Low | 0.17 | | | |
| 38 | 0-3 | 5-15 | 1.55-1.65 | 2.0-6.0 | 0.07-0.11 | 6.1-7.3 | <2 | Low | 0.17 | --- | --- | .5-1 |
| Sonoita | 3-43 | 10-18 | 1.55-1.65 | 2.0-6.0 | 0.07-0.13 | 7.4-8.4 | <2 | Low | 0.17 | | | |
| | 43-60 | 20-30 | 1.50-1.60 | 2.0-6.0 | 0.10-0.15 | 7.4-8.4 | <2 | Low | 0.20 | | | |
| 39 | 0-5 | 10-15 | 1.50-1.60 | 0.6-2.0 | 0.13-0.15 | 6.1-7.3 | <2 | Low | 0.20 | 5 | 3 | .5-1 |
| Sonoita | 5-60 | 10-18 | 1.55-1.65 | 2.0-6.0 | 0.07-0.13 | 7.4-8.4 | <2 | Low | 0.17 | | | |
| 40 | 0-3 | 20-30 | --- | 0.6-2.0 | 0.10-0.17 | 7.4-8.4 | <2 | Low | 0.24 | 3 | 5 | .5-1 |
| Tres Hermanos | 3-19 | 20-30 | --- | 0.2-0.6 | 0.10-0.17 | 7.4-8.4 | 2-4 | Moderate | 0.24 | | | |
| | 19-60 | 15-25 | --- | 0.6-2.0 | 0.07-0.10 | 7.9-8.4 | 2-4 | Low | 0.24 | | | |
| 41 | 0-10 | 20-30 | 1.40-1.50 | 0.2-0.6 | 0.14-0.16 | 6.1-7.3 | <2 | Moderate | 0.37 | 5 | 5 | .5-1 |
| Tubac | 10-36 | 35-60 | 1.20-1.60 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | 2-4 | High | 0.32 | | | |
| | 36-60 | 20-30 | 1.40-1.60 | 0.2-0.6 | 0.08-0.12 | 7.4-8.4 | 2-4 | Moderate | 0.28 | | | |
| 42*: | | | | | | | | | | | | |
| Tubac (Gravelly loam) | 0-7 | 20-25 | 1.50-1.60 | 0.6-2.0 | 0.12-0.18 | 6.1-7.3 | <2 | Moderate | 0.37 | 5 | 5 | .5-1 |
| | 7-37 | 35-60 | 1.20-1.60 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | 2-4 | High | 0.32 | | | |
| | 37-60 | 20-30 | 1.40-1.60 | 0.2-0.6 | 0.08-0.12 | 7.4-8.4 | 2-4 | Moderate | 0.28 | | | |
| Tubac (Gravelly sandy loam) | 0-6 | 20-25 | 1.50-1.60 | 2.0-6.0 | 0.12-0.18 | 6.1-7.3 | <2 | Moderate | 0.37 | 5 | 5 | .5-1 |
| | 6-36 | 35-60 | 1.20-1.60 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | 2-4 | High | 0.32 | | | |
| | 36-60 | 20-30 | 1.40-1.60 | 0.2-0.6 | 0.08-0.12 | 7.4-8.4 | 2-4 | Moderate | 0.28 | | | |
| 43*: | | | | | | | | | | | | |
| Tubac | 0-8 | 20-25 | 1.40-1.50 | 2.0-6.0 | 0.12-0.18 | 6.1-7.3 | <2 | Moderate | 0.37 | 5 | 5 | .5-1 |
| | 8-38 | 35-60 | 1.20-1.60 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | 2-4 | High | 0.32 | | | |
| | 38-60 | 20-30 | 1.40-1.60 | 0.2-0.6 | 0.08-0.12 | 7.4-8.4 | 2-4 | Moderate | 0.28 | | | |
| Sonoita | 0-4 | 10-15 | 1.50-1.60 | 0.6-2.0 | 0.13-0.15 | 6.1-7.3 | <2 | Low | 0.20 | 5 | 3 | .5-1 |
| | 4-34 | 10-18 | 1.55-1.65 | 2.0-6.0 | 0.07-0.13 | 7.4-8.4 | <2 | Low | 0.17 | | | |
| | 34-60 | 20-30 | 1.50-1.60 | 2.0-6.0 | 0.10-0.15 | 7.4-8.4 | <2 | Low | 0.20 | | | |

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Clay <2mm | Moist bulk density | Permeability | Available water capacity | Soil reaction | Salinity | Shrink-swell potential | Erosion factors | | Wind erodibility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | K | T | | |
| | In | Pct | $G/cm^3$ | In/hr | In/in | pH | Mmhos/cm | | | | | Pct |
| 44<br>Vekol | 0-10 | 20-25 | 1.25-1.30 | 0.6-2.0 | 0.16-0.18 | 7.4-8.4 | <2 | Low | 0.43 | 5 | 4L | .3-1 |
| | 10-47 | 35-50 | 1.20-1.50 | 0.06-0.2 | 0.14-0.21 | 7.4-9.0 | 2-4 | High | 0.28 | | | |
| | 47-54 | 15-30 | 1.25-1.45 | 0.6-2.0 | 0.08-0.19 | 7.4-9.0 | 2-4 | Low | 0.28 | | | |
| 45*: | | | | | | | | | | | | |
| White House | 0-2 | 20-30 | 1.30-1.40 | 0.6-2.0 | 0.12-0.19 | 5.6-6.5 | <2 | Moderate | 0.37 | 5 | 6 | 1-2 |
| | 2-28 | 35-60 | 1.20-1.30 | 0.06-0.2 | 0.14-0.16 | 6.6-8.4 | <2 | High | 0.32 | | | |
| | 28-50 | 30-45 | 1.30-1.40 | 0.2-0.6 | 0.10-0.14 | 7.9-8.4 | <2 | Moderate | 0.37 | | | |
| Forrest | 0-2 | 10-20 | 1.40-1.65 | 0.6-2.0 | 0.07-0.14 | 5.6-7.3 | <2 | Low | 0.37 | 5 | 3 | 1-2 |
| | 2-38 | 40-50 | 1.50-1.60 | 0.06-0.2 | 0.14-0.16 | 7.4-8.4 | <2 | High | 0.28 | | | |
| | 38-54 | 25-35 | 1.40-1.55 | 0.2-0.6 | 0.10-0.16 | 7.4-9.0 | 2-4 | Moderate | 0.32 | | | |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

| Soil name and map symbol | Hydrologic group | Flooding |  |  | High water table |  |  | Bedrock |  | Cemented pan |  | Risk of corrosion |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness | Depth | Hardness | Uncoated steel | Concrete |
|  |  |  |  |  | Ft |  |  | In |  | In |  |  |  |
| 1*: |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Anthony---------- | B | Frequent---- | Brief----- | Jul-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Gila------------- | B | Frequent---- | Brief----- | Jul-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 2*: |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Arizo------------ (Fine sandy loam) | A | Occasional | Very brief | Mar-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Arizo------------ (Gravelly sandy loam) | A | Occasional | Very brief | Mar-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Arizo------------ (Gravelly loamy sand) | A | Occasional | Very brief | Mar-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 3---------------- Artesia | D | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | 20-40 | Rippable | Moderate | Low. |
| 4*: |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Atascosa--------- | D | None-------- | --- | --- | >6.0 | --- | --- | 4-20 | Rippable | --- | --- | High----- | Low. |
| Chiricahua------- | D | None-------- | --- | --- | >6.0 | --- | --- | 10-20 | Rippable | --- | --- | Moderate | Low. |
| Rock outcrop. |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5*: |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Atascosa--------- | D | None-------- | --- | --- | >6.0 | --- | --- | 4-20 | Rippable | --- | --- | High----- | Low. |
| Graham----------- | D | None-------- | --- | --- | >6.0 | --- | --- | 8-20 | Hard | --- | --- | High----- | Low. |
| Rock outcrop. |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6---------------- Bluepoint | A | Rare-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | High. |
| 7*: |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bluepoint-------- | A | Rare-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | High. |
| Gothard---------- | D | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | High. |
| 8---------------- Bonita | D | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding | | | High water table | | | Bedrock | | Cemented pan | | Risk of corrosion | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness | Depth | Hardness | Uncoated steel | Concrete |
| | | | | | Ft | | | In | | In | | | |
| 9<br>Bucklebar | B | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| 10*: | | | | | | | | | | | | | |
| Calciorthids. | | | | | | | | | | | | | |
| Torriorthents. | | | | | | | | | | | | | |
| 11*: | | | | | | | | | | | | | |
| Cave | D | None | --- | --- | >6.0 | --- | --- | >60 | --- | 4-20 | Hard | High | Low. |
| Durorthids. | | | | | | | | | | | | | |
| 12*: | | | | | | | | | | | | | |
| Comoro (Fine sandy loam) | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| Comoro (Gravelly sandy loam) | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| Comoro (Sandy loam) | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| 13*: | | | | | | | | | | | | | |
| Continental | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| Tubac | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| 14, 15<br>Dona Ana | B | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 16, 17<br>Eba | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 18*: | | | | | | | | | | | | | |
| Faraway | D | None | --- | --- | >6.0 | --- | --- | 5-20 | Hard | --- | --- | Moderate | Low. |
| Rock outcrop. | | | | | | | | | | | | | |
| 19*: | | | | | | | | | | | | | |
| Forrest | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| White House | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| Kimbrough | D | None | --- | --- | >6.0 | --- | --- | >60 | --- | 4-20 | Hard | Moderate | Low. |
| 20<br>Gila | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding | | | High water table | | | Bedrock | | Cemented pan | | Risk of corrosion | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness | Depth | Hardness | Uncoated steel | Concrete |
| | | | | | Ft | | | In | | In | | | |
| 21*: | | | | | | | | | | | | | |
| Gila | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| Anthony | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| Bluepoint | A | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | High. |
| 22*, 23*: | | | | | | | | | | | | | |
| Glendale | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| Gila | B | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 24*: | | | | | | | | | | | | | |
| Glendale | B | Frequent | Brief | Jul-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| Gila | B | Frequent | Brief | Jul-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 25*: | | | | | | | | | | | | | |
| Graham | D | None | --- | --- | >6.0 | --- | --- | 8-20 | Hard | --- | --- | High | Low. |
| Rock outcrop. | | | | | | | | | | | | | |
| 26<br>Guest | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 27*: | | | | | | | | | | | | | |
| Guest | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| Hantz | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| 28<br>Hondale | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| 29*: | | | | | | | | | | | | | |
| Hondale (Loam) | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| Hondale (Fine sandy loam) | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| Hondale (Silt loam) | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| 30<br>Kimbrough | D | None | --- | --- | >6.0 | --- | --- | >60 | --- | 4-20 | Hard | Moderate | Low. |
| 31*: | | | | | | | | | | | | | |
| Mabray | D | None | --- | --- | >6.0 | --- | --- | 4-20 | Hard | --- | --- | Moderate | Low. |
| Rock outcrop. | | | | | | | | | | | | | |

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding | | | High water table | | | Bedrock | | Cemented pan | | Risk of corrosion | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness | Depth | Hardness | Uncoated steel | Concrete |
| | | | | | Ft | | | In | | In | | | |
| 32*: | | | | | | | | | | | | | |
| Mokiak----------- | B | None-------- | --- | --- | >6.0 | --- | --- | 30-40 | Hard | --- | --- | High----- | Low. |
| Faraway---------- | D | None-------- | --- | --- | >6.0 | --- | --- | 5-20 | Hard | --- | --- | Moderate | Low. |
| Rock outcrop. | | | | | | | | | | | | | |
| 33*: | | | | | | | | | | | | | |
| Pima------------- | B | Rare-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Grabe------------ | B | Rare-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 34*: | | | | | | | | | | | | | |
| Pima------------- | B | Frequent---- | Brief----- | Jul-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Grabe------------ | B | Frequent---- | Brief----- | Jul-Sep | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Moderate |
| 35---------------- Pridham | D | Occasional | Brief----- | Jul-Oct | 2.0-3.0 | Apparent | Jul-Dec | >60 | --- | --- | --- | High----- | Low. |
| 36*: | | | | | | | | | | | | | |
| Santo Tomas------ (Cobbly fine sandy loam) | B | Rare-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Low------- | Low. |
| Santo Tomas------ (Very gravelly loam) | B | Rare-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| 37---------------- Signal | C | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 38, 39------------ Sonoita | B | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 40---------------- Tres Hermanos | B | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 41---------------- Tubac | C | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 42*: | | | | | | | | | | | | | |
| Tubac------------ (Gravelly loam) | C | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Tubac------------ (Gravelly sandy loam) | C | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| 43*: | | | | | | | | | | | | | |
| Tubac------------ | C | None-------- | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High----- | Low. |

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

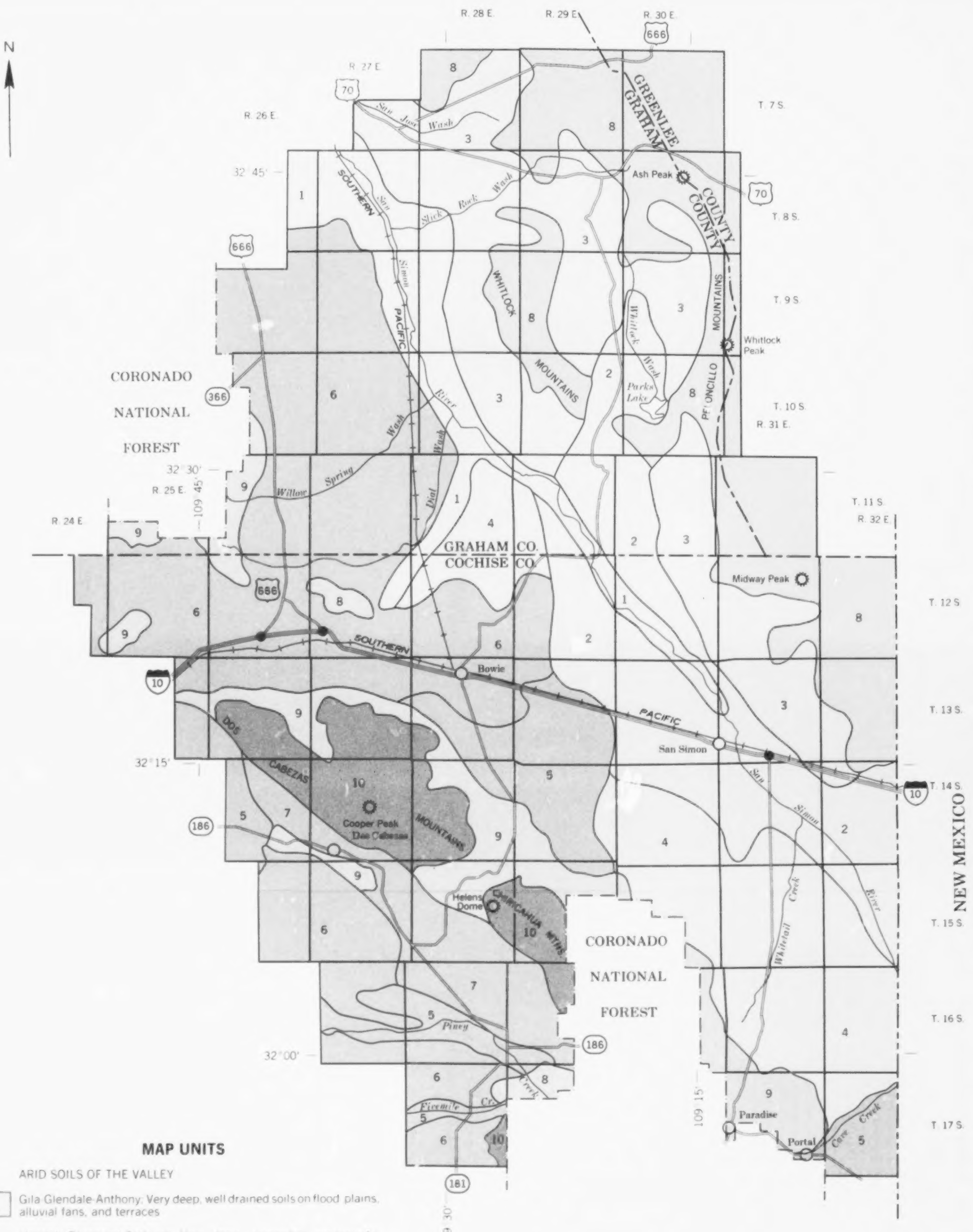
| Soil name and map symbol | Hydrologic group | Flooding | | | High water table | | | Bedrock | | Cemented pan | | Risk of corrosion | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness | Depth | Hardness | Uncoated steel | Concrete |
| | | | | | Ft | | | In | | In | | | |
| 43*: | | | | | | | | | | | | | |
| Sonoita | B | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 44<br>Vekol | D | Rare | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |
| 45*: | | | | | | | | | | | | | |
| White House | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Moderate |
| Forrest | C | None | --- | --- | >6.0 | --- | --- | >60 | --- | --- | --- | High | Low. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

| Soil name | Family or higher taxonomic class |
|---|---|
| Anthony | Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents |
| Arizo | Sandy-skeletal, mixed, thermic Typic Torriorthents |
| Artesia | Clayey-skeletal, mixed, thermic Haplic Durargids |
| Atascosa | Loamy-skeletal, mixed, thermic Lithic Argiustolls |
| Bluepoint | Mixed, thermic Typic Torripsamments |
| Bonita | Fine, montmorillonitic, thermic Typic Chromusterts |
| Bucklebar | Fine-loamy, mixed, thermic Typic Haplargids |
| Cave | Loamy, mixed, thermic, shallow Typic Paleorthids |
| Chiricahua | Clayey, mixed, thermic, shallow Ustollic Haplargids |
| Comoro | Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents |
| Continental | Fine, mixed, thermic Typic Haplargids |
| Dona Ana | Fine-loamy, mixed, thermic Typic Haplargids |
| Eba | Clayey-skeletal, mixed, thermic Typic Haplargids |
| Faraway | Loamy-skeletal, mixed, mesic Lithic Haplustolls |
| Forrest | Fine, mixed, thermic Ustollic Haplargids |
| Gila | Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents |
| Glendale | Fine-silty, mixed (calcareous), thermic Typic Torrifluvents |
| Gothard | Fine-loamy, mixed, thermic Typic Natrargids |
| Grabe | Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents |
| Graham | Clayey, montmorillonitic, thermic Lithic Argiustolls |
| Guest | Fine, mixed (calcareous), thermic Vertic Torrifluvents |
| Hantz | Fine, mixed (calcareous), thermic Typic Torrifluvents |
| Hondale | Fine, mixed, thermic Typic Natrargids |
| Kimbrough | Loamy, mixed, thermic, shallow Petrocalcic Calciustolls |
| Mabray | Loamy-skeletal, carbonatic, thermic Lithic Haplustolls |
| Mokiak | Loamy-skeletal, mixed, mesic Aridic Argiustolls |
| Pima | Fine-silty, mixed (calcareous), thermic Typic Torrifluvents |
| Pridham | Fine, mixed, thermic Typic Natraquolls |
| Santo Tomas | Loamy-skeletal, mixed, thermic Pachic Haplustolls |
| Signal | Clayey-skeletal, montmorillonitic, thermic Aridic Paleustolls |
| Sonoita | Coarse-loamy, mixed, thermic Typic Haplargids |
| Tres Hermanos | Fine-loamy, mixed, thermic Typic Haplargids |
| Tubac | Fine, mixed, thermic Typic Paleargids |
| Vekol | Fine, mixed, thermic Typic Haplargids |
| White House | Fine, mixed, thermic Ustollic Haplargids |

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980-271-960/23


N
R. 24 E.
R. 25 E.
R. 26 E.
R. 27 E.
R. 28 E.
R. 29 E.
R. 30 E.
R. 31 E.
R. 32 E.
T. 7 S.
T. 8 S.
T. 9 S.
T. 10 S.
T. 11 S.
T. 12 S.
T. 13 S.
T. 14 S.
T. 15 S.
T. 16 S.
T. 17 S.
32°45'
32°30'
32°15'
32°00'
109°45'
109°30'
109°15'
GREENLEE
GRAHAM
COUNTY
COUNTY
GRAHAM CO.
COCHISE CO.
NEW MEXICO
CORONADO NATIONAL FOREST
CORONADO NATIONAL FOREST
Ash Peak
Whitlock Peak
Midway Peak
Cooper Peak Dos Cabezas
Helens Dome
Bowie
San Simon
Paradise
Portal
San Juan Wash
Slick Rock Wash
San Simon River
Whitlock Wash
Parks Lake
Dial Wash
Willow Spring Wash
Whitetail Creek
Cave Creek
Pinery Creek
Fivemile Creek
WHITLOCK MOUNTAINS
PELONCILLO MOUNTAINS
DOS CABEZAS MOUNTAINS
CHIRICAHUA MTNS.
SOUTHERN PACIFIC
70
666
366
186
181
10
1
2
3
4
5
6
7
8
9
10

## MAP UNITS

| | |
|---|---|
| | ARID SOILS OF THE VALLEY |
| 1 | Gila-Glendale-Anthony: Very deep, well drained soils on flood plains, alluvial fans, and terraces |
| 2 | Hondale-Bluepoint-Gothard: Very deep, somewhat excessively drained to moderately well drained, saline and sodic soils on dunes, alluvial fans, and terraces |
| 3 | Tres Hermanos-Artesia: Very deep to moderately deep, well drained soils on alluvial fans and terraces |
| 4 | Eba-Tres Hermanos-Dona Ana: Very deep, well drained soils on alluvial fans and terraces |
| | SEMIARID SOILS OF THE VALLEY |
| 5 | Pima-Comoro-Santo Tomas: Very deep, well drained soils on flood plains, alluvial fans, and terraces |
| 6 | Tubac-Sonoita-Signal: Very deep, well drained soils on valley side slopes, alluvial fans, and terraces |
| 7 | White House-Forrest: Very deep, well drained soils on valley plains and alluvial fans |
| | SEMIARID SOILS OF THE MOUNTAINS, HILLS, HIGH FANS, AND VALLEY PLAINS |
| 8 | Graham-Atascosa-Bonita: Shallow to deep, well drained soils on mountains, hills, alluvial fans, and valley plains |
| 9 | Atascosa-Chiricahua-Mabray: Shallow, well drained soils on mountains and hills |
| | SUBHUMID SOILS OF THE MOUNTAINS |
| 10 | Mokiak-Faraway-Rock outcrop: Shallow to moderately deep, well drained soils and Rock outcrop on mountains and hills |

Compiled 1979

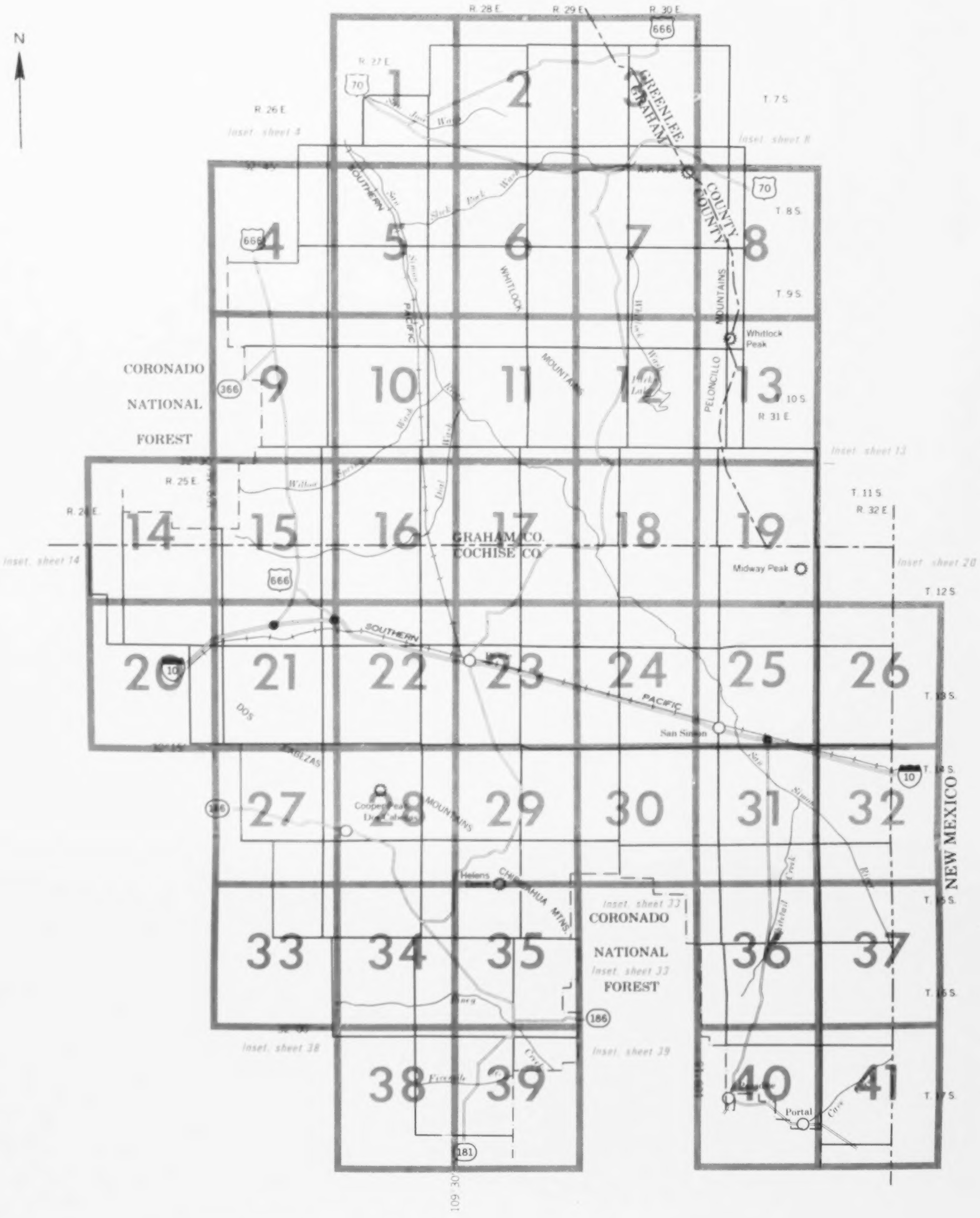
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
UNIVERSITY OF ARIZONA AGRICULTURAL EXPERIMENT STATION

# GENERAL SOIL MAP

## SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM, AND GREENLEE COUNTIES

Scale 1: 443,520
1 0 1 2 3 4 5 6 7 MILES

*Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.*


N
R. 26 E.
R. 27 E.
R. 28 E.
R. 29 E.
R. 30 E.
T. 7 S.
T. 8 S.
T. 9 S.
T. 10 S.
R. 31 E.
T. 11 S.
R. 32 E.
T. 12 S.
T. 13 S.
T. 14 S.
T. 15 S.
T. 16 S.
T. 17 S.
R. 25 E.
R. 24 E.
32°45'
32°30'
32°15'
32°00'
109°30'
Inset, sheet 4
Inset, sheet 8
Inset, sheet 13
Inset, sheet 14
Inset, sheet 20
Inset, sheet 33
Inset, sheet 38
Inset, sheet 39
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
GREENLEE
GRAHAM
COUNTY
COUNTY
GRAHAM CO.
COCHISE CO.
CORONADO
NATIONAL
FOREST
NEW MEXICO
SOUTHERN
PACIFIC
San Simon
Whitlock Peak
Midway Peak
PELONCILLO
MOUNTAINS
WHITLOCK
MOUNTAINS
CHIRICAHUA MTNS.
DOS
CABEZAS
MOUNTAINS
Cooper Peak
Helens Dome
Portal
70
666
366
186
181
10

# INDEX TO MAP SHEETS

SAN SIMON AREA, ARIZONA, PARTS OF
COCHISE, GRAHAM, AND GREENLEE COUNTIES

Scale 1: 443,520

1 0 1 2 3 4 5 6 7 MILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SAN SIMON AREA, ARIZONA, AND PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES

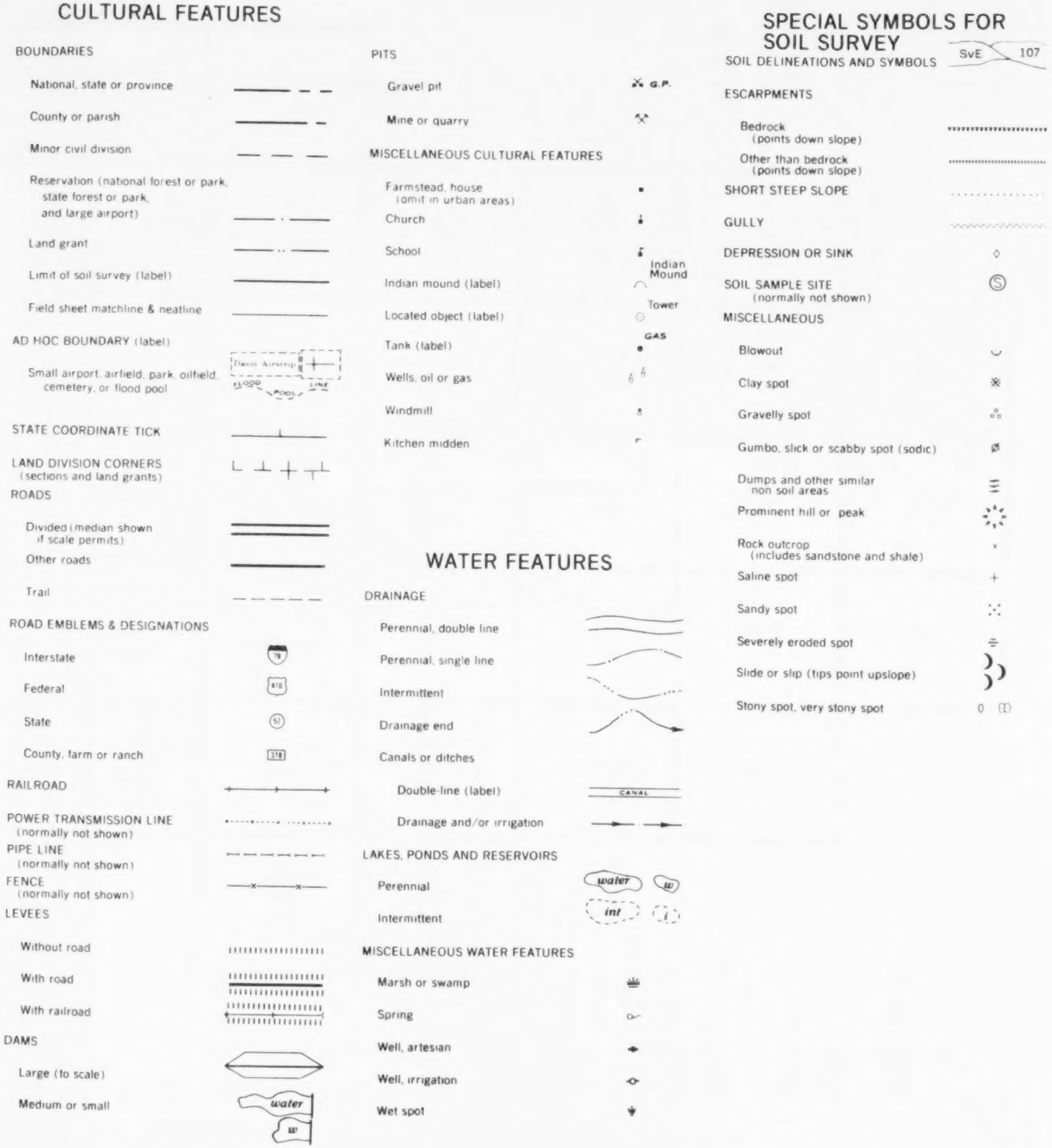
ARIZONA AGRICULTURAL EXPERIMENT STATION

## SOIL LEGEND

| SYMBOL | NAME |
|---|---|
| 1 | Anthony-Gila complex |
| 2 | Arizo soils |
| 3 | Artesia cobbly fine sandy loam |
| 4 | Atascosa-Chiricahua-Rock outcrop complex |
| 5 | Atascosa-Graham-Rock outcrop complex |
| 6 | Bluepoint loamy sand |
| 7 | Bluepoint-Gothard complex |
| 8 | Bonita cobbly silty clay |
| 9 | Bucklebar fine sandy loam* |
| 10 | Calciorthids and Torriorthents, eroded |
| 11 | Cave-Durorthids complex |
| 12 | Comoro soils |
| 13 | Continental-Tubac complex |
| 14 | Dona Ana fine sandy loam, 0 to 2 percent slopes* |
| 15 | Dona Ana fine sandy loam, 0 to 5 percent slopes |
| 16 | Eba gravelly sandy loam* |
| 17 | Eba gravelly fine sandy loam* |
| 18 | Faraway-Rock outcrop complex |
| 19 | Forrest-White House-Kimbrough complex |
| 20 | Gila loam |
| 21 | Gila-Anthony-Bluepoint complex |
| 22 | Glendale-Gila complex* |
| 23 | Glendale-Gila complex, eroded |
| 24 | Glendale-Gila association, frequently flooded |
| 25 | Graham-Rock outcrop complex |
| 26 | Guest silty clay loam* |
| 27 | Guest and Hantz soils |
| 28 | Hondale silty clay loam* |
| 29 | Hondale complex |
| 30 | Kimbrough gravelly fine sandy loam |
| 31 | Mabray-Rock outcrop complex |
| 32 | Mokiak-Farway-Rock outcrop complex |
| 33 | Pima-Grabe silt loam* |
| 34 | Pima-Grabe association |
| 35 | Pridham silty clay loam |
| 36 | Santo Tomas soils |
| 37 | Signal gravelly loam |
| 38 | Sonoita gravelly sandy loam |
| 39 | Sonoita fine sandy loam* |
| 40 | Tres Hermanos gravelly loam |
| 41 | Tubac sandy clay loam, 0 to 2 percent slopes* |
| 42 | Tubac soils, 0 to 5 percent slopes |
| 43 | Tubac-Sonoita complex |
| 44 | Vekol loam* |
| 45 | White House-Forrest association |

*The compostition of these units is more narrowly defined than that of others of the survey area and provide more precise information about the component soils

# CONVENTIONAL AND SPECIAL SYMBOLS LEGEND



## CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS
(sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE
(normally not shown)

PIPE LINE
(normally not shown)

FENCE
(normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

## WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

## SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

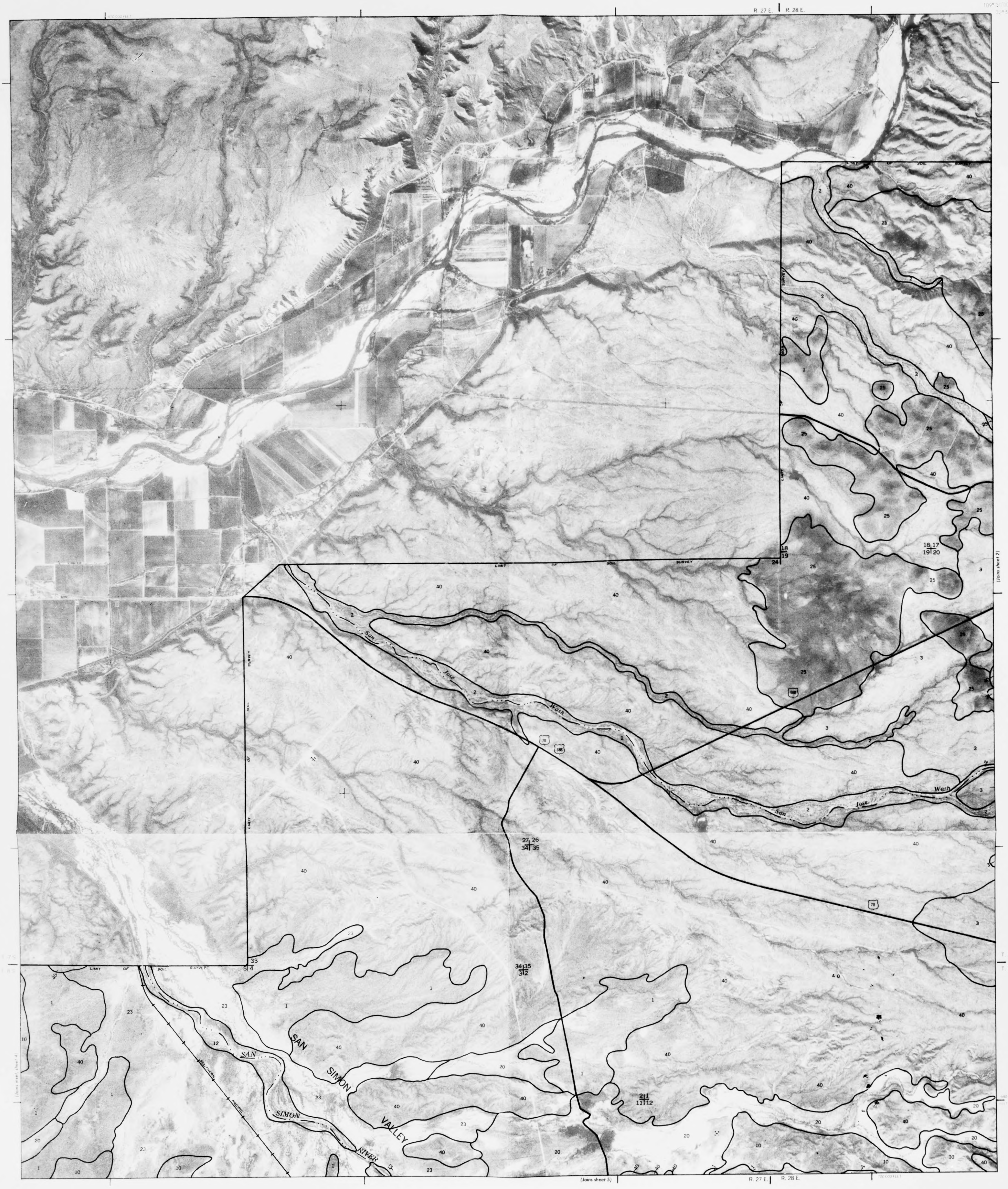
SOIL SAMPLE SITE
(normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(SAFFORD SE QUADRANGLE)


R. 27 E.
R. 28 E.
109° 30′00″
32°52′30″
LIMIT OF SOIL SURVEY
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 5)
T. 7 S.
T. 8 S.
San Jose Wash
SAN SIMON VALLEY
SAN SIMON RIVER
SOUTHERN PACIFIC
70
666
18 17
19 20
18
19
24
27 26
34 35
33
5 4
34 35
3 2
2 1
11 12
700 000 FEET
1
2
3
10
12
20
23
25
40

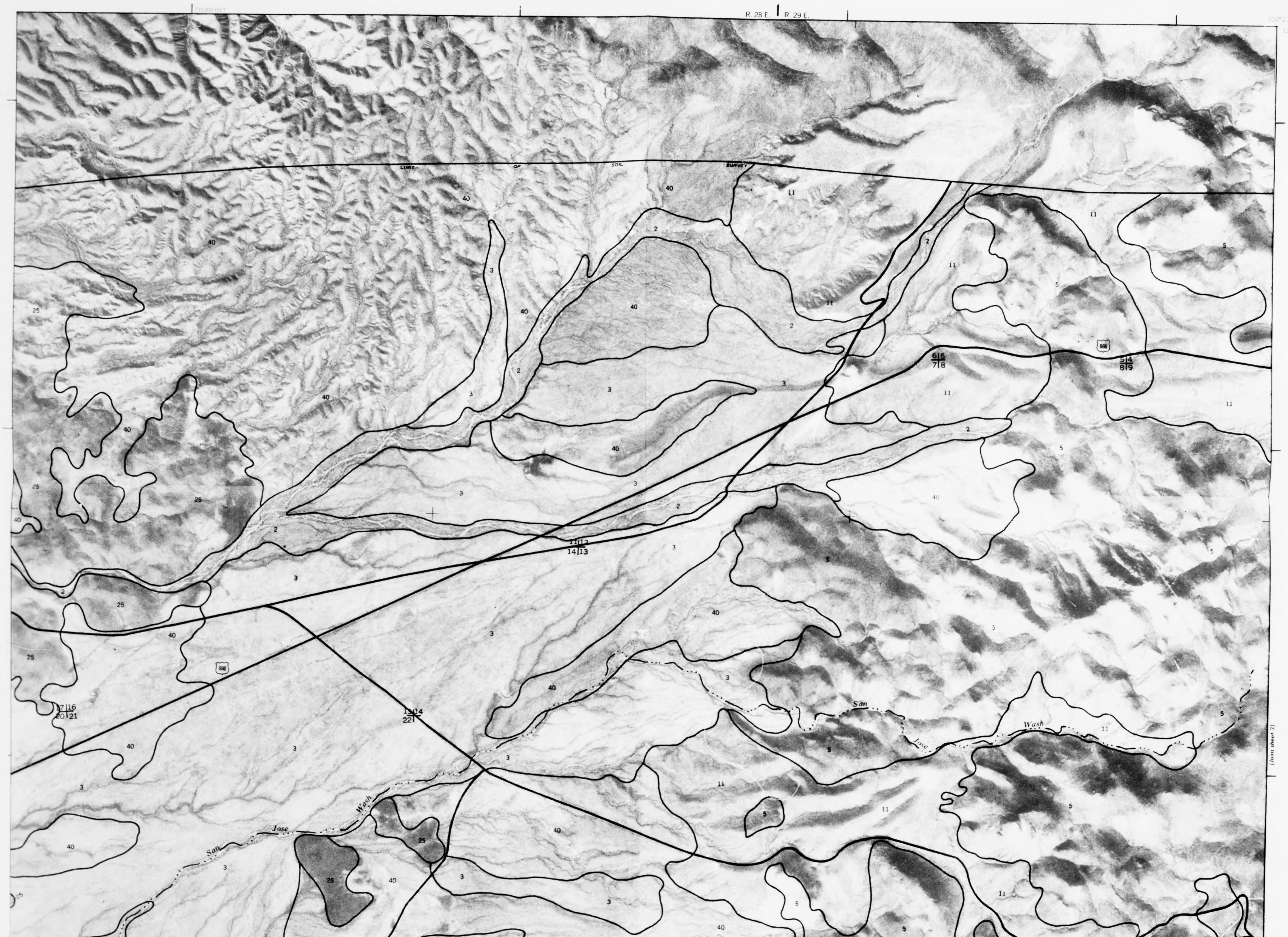
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 2
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(GUTHRIE SW QUADRANGLE)


R. 28 E.
R. 29 E.
LIMIT OF SOIL SURVEY
San Jose Wash
Slick Rock Wash
(Joins sheet 3)
(Joins sheet 6)
T. 7 S.
T. 8 S.
666
70
740 000 FEET
40
11
2
3
5
25
11|12
14|13
6|5
7|8
5|4
8|9
17|16
20|21
15|14
22|23
28|27
33|34
3|2
10|11

1 ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

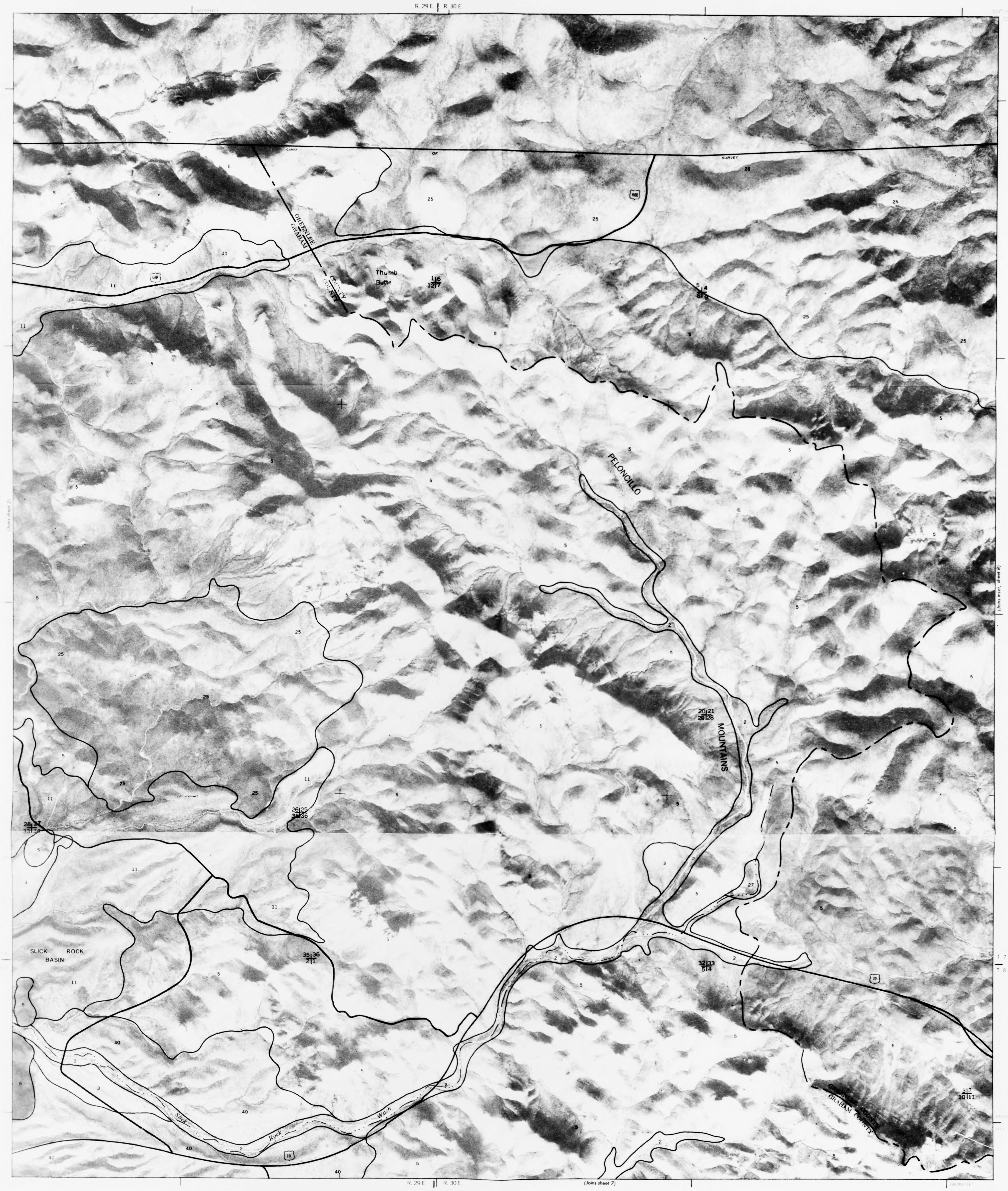
Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

SAN SIMON AREA, ARIZONA NO. 2

SHEET NO. 2 OF 41

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 3
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(GUTHRIE SE QUADRANGLE)


R. 29 E.
R. 30 E.
LIMIT OF SURVEY
GREENLEE GRAHAM COUNTY COUNTY
Thumb Butte
1|6
12|7
5|4
8|9
666
PELONCILLO MOUNTAINS
(Joins sheet 2)
(Joins inset, sheet 8)
20|21
29|28
28|27
33|34
26|25
35|36
35|36
2|1
32|33
5|4
SLICK ROCK BASIN
Slick Rock Wash
70
T. 7 S.
T. 8 S.
GREENLEE COUNTY GRAHAM COUNTY
3|2
10|11
780 000 FEET
R. 29 E.
R. 30 E.
(Joins sheet 7)
2
3
5
11
25
27
40

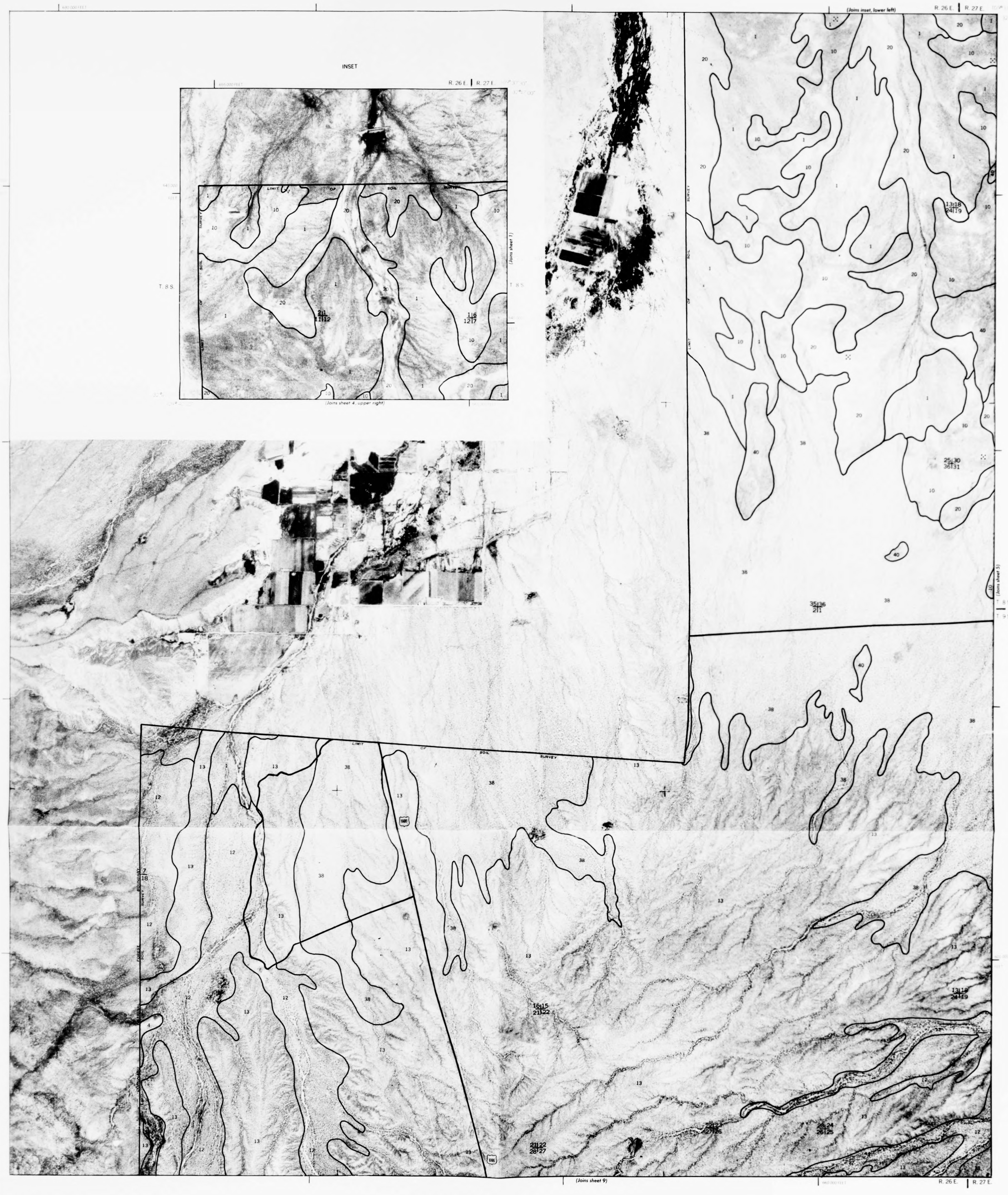
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1972 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 4
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(ARTESIA QUADRANGLE)


INSET
R. 26 E.
R. 27 E.
T. 8 S.
T. 9 S.
LIMIT OF SOIL SURVEY
(Joins sheet 1)
(Joins sheet 4, upper right)
(Joins inset, lower left)
(Joins sheet 5)
(Joins sheet 9)
666

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Scale 1:24000
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet

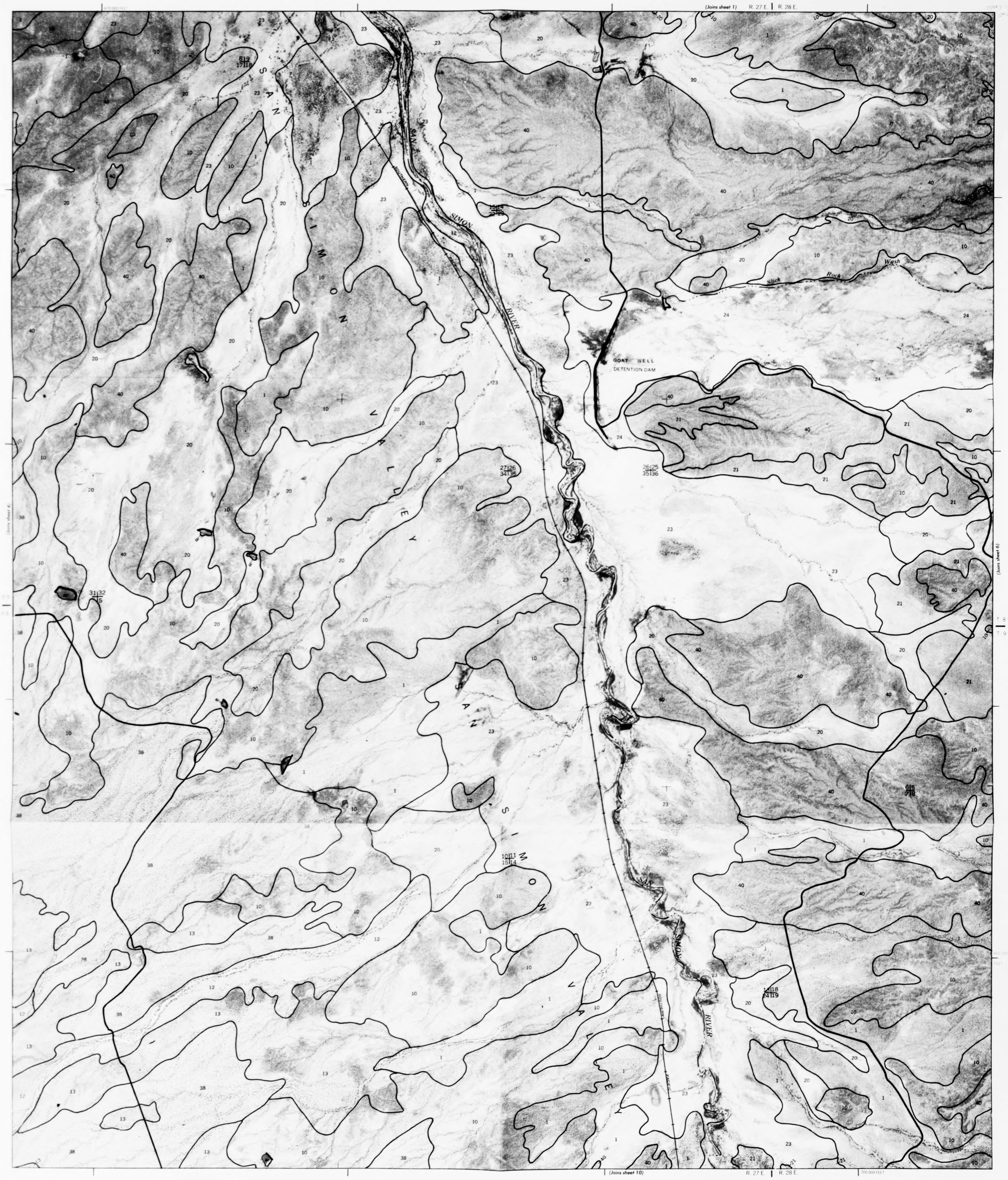
Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

SAN SIMON AREA, ARIZONA NO. 4

SHEET NO. 4 OF 41

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 5
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(ARTESIA NE QUADRANGLE)


(Joins sheet 1)
R. 27 E.
R. 28 E.
SAN SIMON VALLEY
SAN SIMON RIVER
SOUTHERN PACIFIC
Slick Rock Wash
GOAT WELL
DETENTION DAM
(Joins sheet 4)
(Joins sheet 6)
T. 8 S.
T. 9 S.
(Joins sheet 10)
700 000 FEET

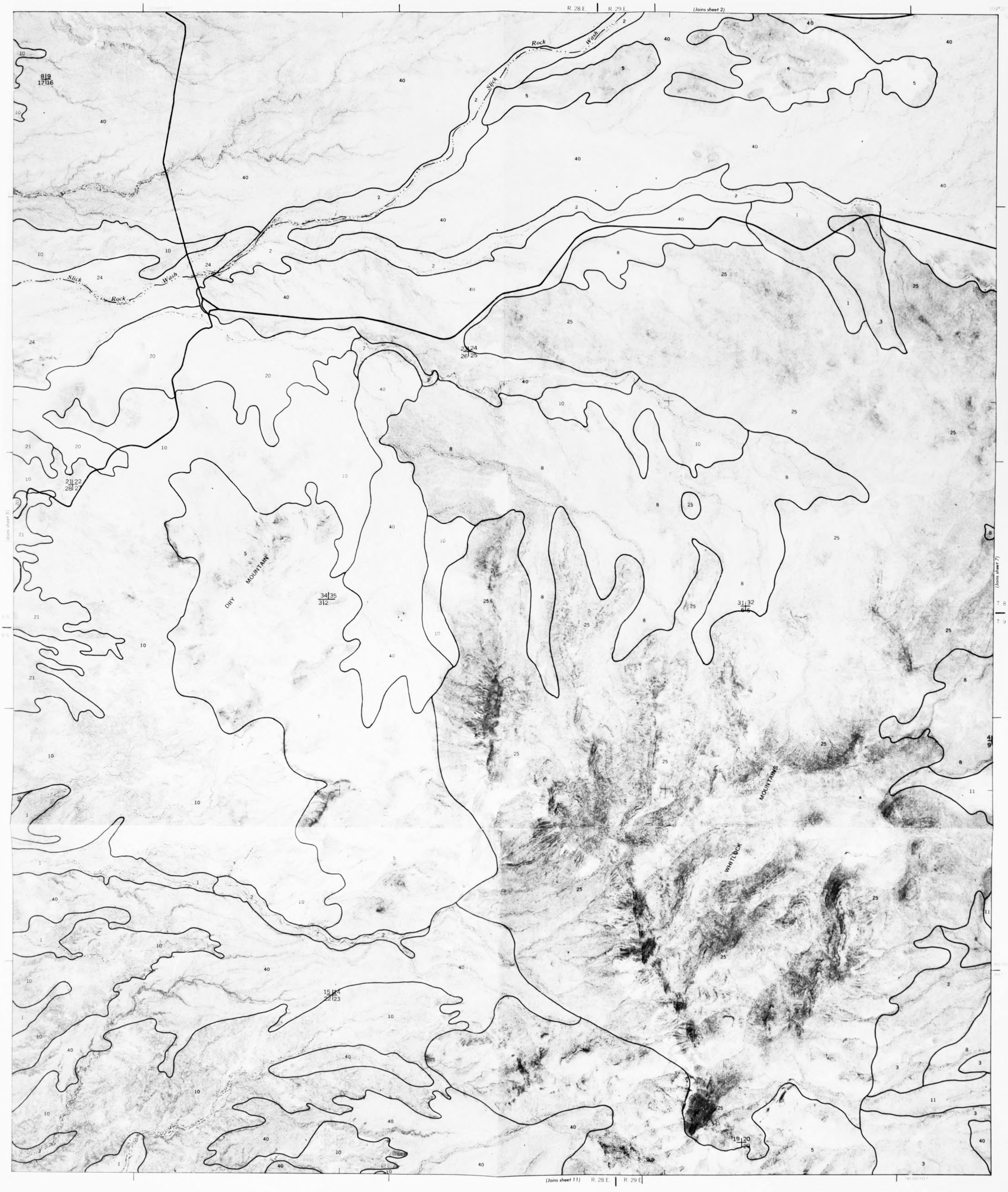
1 ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 6
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(DRY MOUNTAIN QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 2)
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 11)
T. 8 S.
T. 9 S.
Slick Rock Wash
DRY MOUNTAIN
WHITLOCK MOUNTAINS
8|9 17|16
23|24 26|25
21|22 28|27
34|35 3|2
31|32 6|5
15|14 22|23
19|20 30|29
740 000 FEET

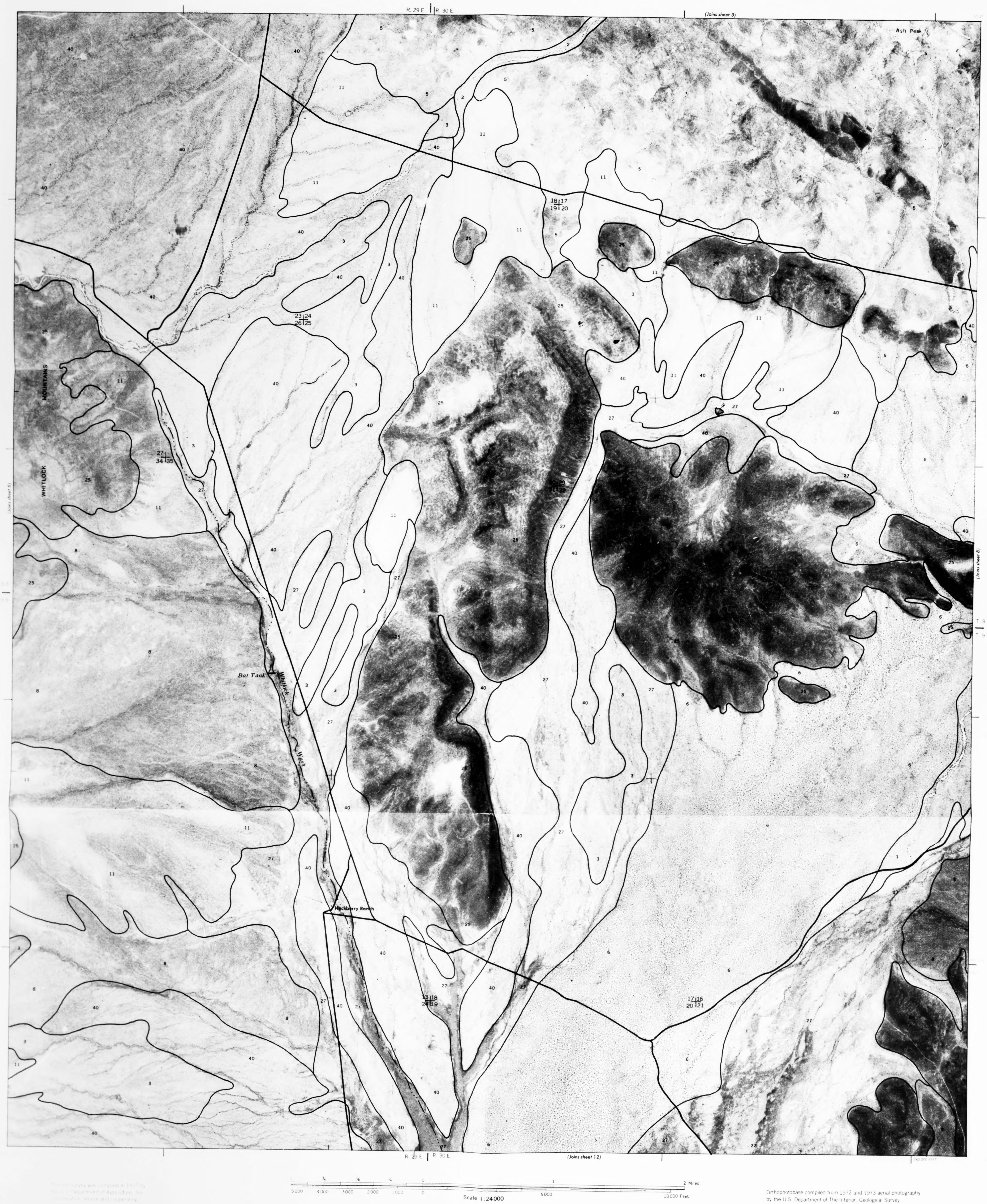
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Scale 1:24000

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 7
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(WHITLOCK MOUNTAINS NE QUADRANGLE)


R. 29 E.
R. 30 E.
(Joins sheet 3)
Ash Peak
WHITLOCK
MOUNTAINS
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 12)
Bat Tank
Whitlock
Wash
Hackberry Ranch
T. 8 S.
T. 9 S.
18 17
19 20
23 24
26 25
27
34 35
17 16
20 21
23 18
24 19
780 000 FEET
1
¾
½
¼
0
1
2 Miles
5 000
4 000
3 000
2 000
1 000
0
5 000
10 000 Feet
2
3
5
6
8
11
25
27
40

Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

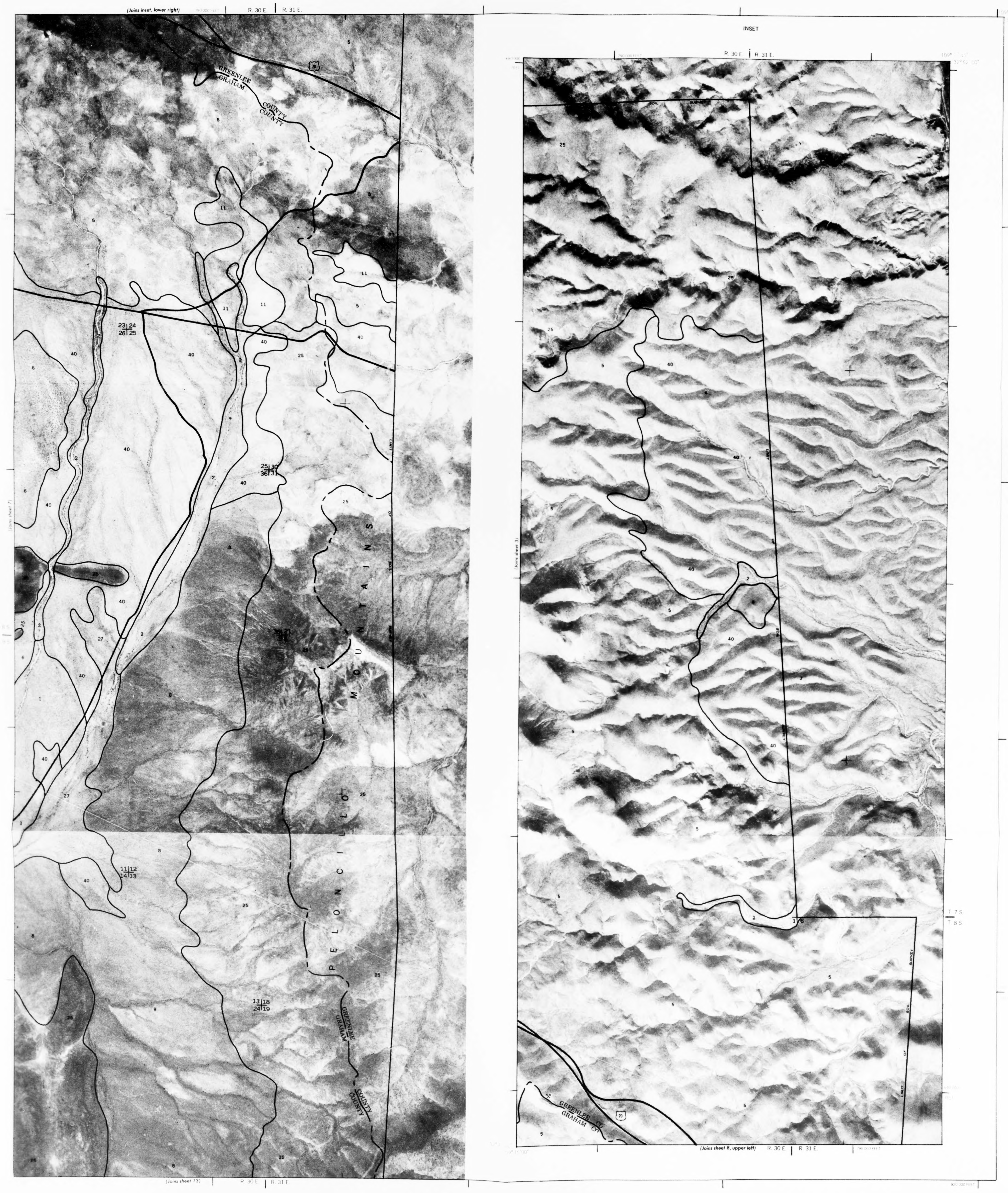
Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

SAN SIMON AREA, ARIZONA NO. 7

SHEET NO. 7 OF 41

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 8
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(DUNCAN NW QUADRANGLE AND PART OF YORK VALLEY SW QUADRANGLE)


(Joins inset, lower right)
R. 30 E.
R. 31 E.
GREENLEE COUNTY
GRAHAM COUNTY
PELONCILLO MOUNTAINS
SOIL SURVEY LIMIT
(Joins sheet 7)
(Joins sheet 13)
INSET
(Joins sheet 3)
(Joins sheet 8, upper left)
T. 7 S.
T. 8 S.
GREENLEE CO.
GRAHAM CO.
70
5
11
40
25
2
6
8
27
1
23 | 24
26 | 25
25 | 30
36 | 31
11 | 12
14 | 13
13 | 18
24 | 19
1 | 6

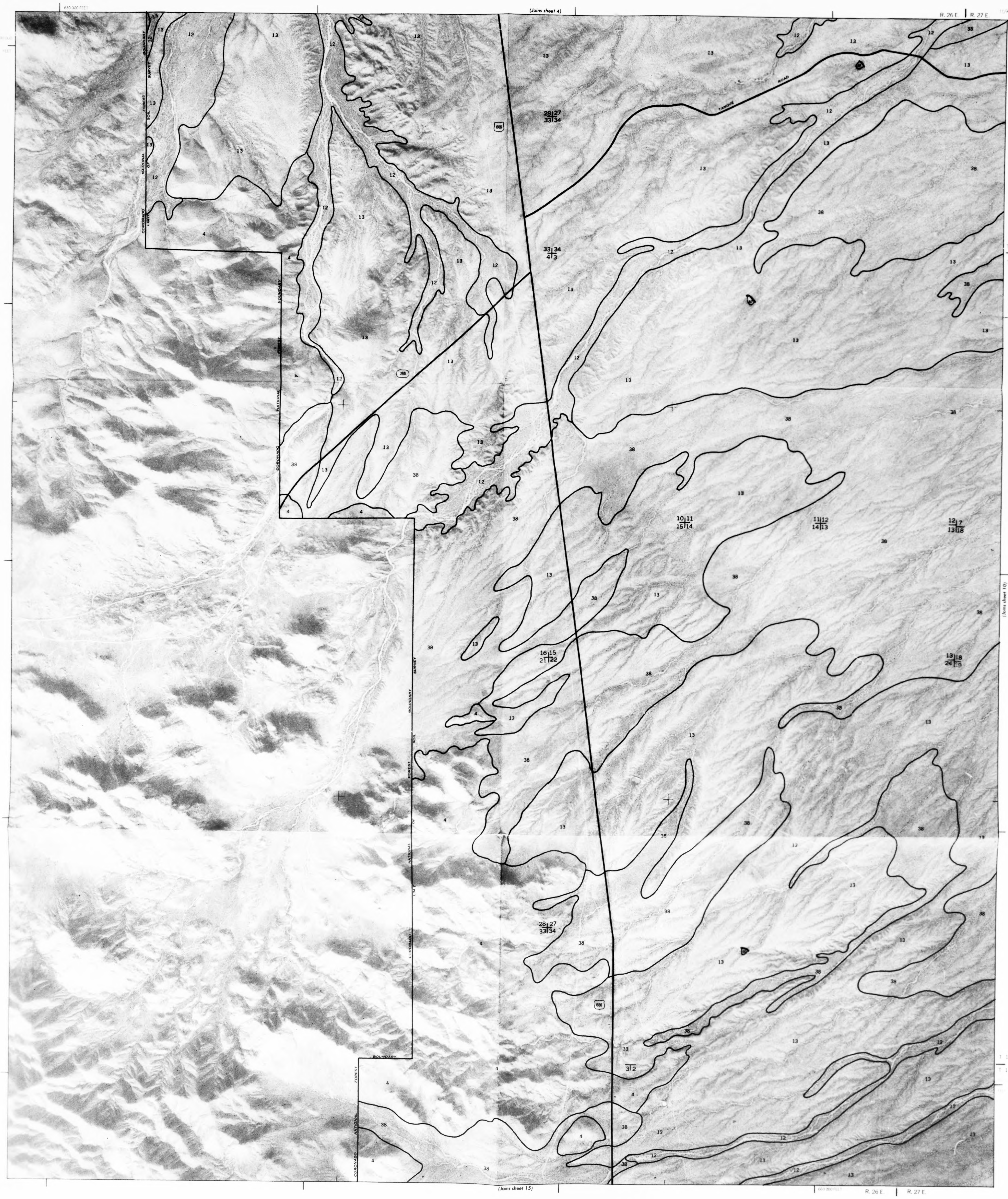
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 9
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(GILLESPIE MOUNTAIN QUADRANGLE)


(Joins sheet 4)
(Joins sheet 15)
(Joins sheet 10)
630 000 FEET
660 000 FEET
R. 26 E.
R. 27 E.
CORONADO NATIONAL FOREST BOUNDARY
SOIL SURVEY BOUNDARY
TANQUE ROAD
666
28|27
33|34
33|34
4|3
10|11
15|14
11|12
14|13
12|7
13|18
16|15
21|22
13|18
24|19
3|2
4
12
13
38

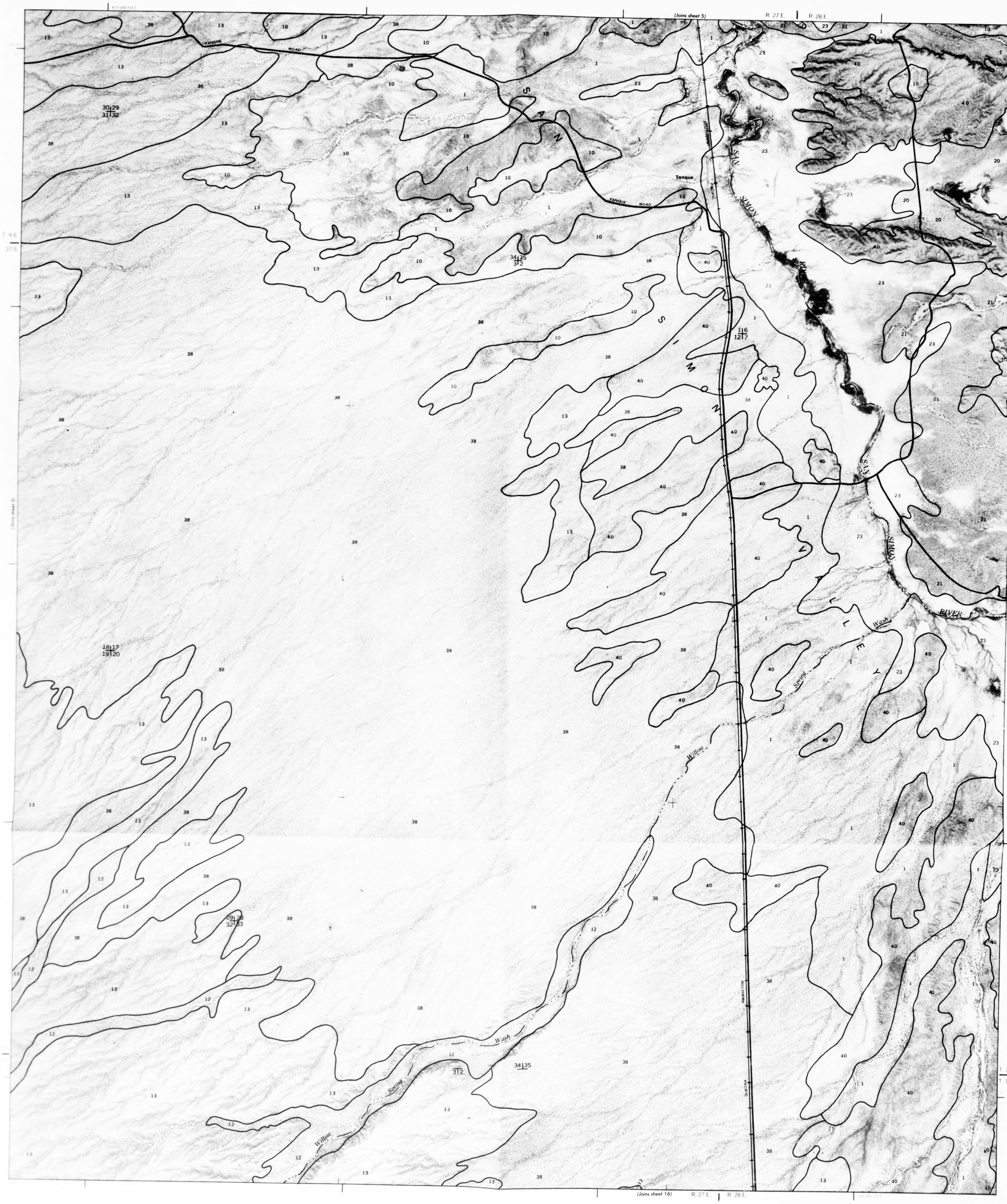
Scale 1:24 000
1 ¾ ½ ¼ 0 1 2 Miles
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 10
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(TANQUE QUADRANGLE)


(Joins sheet 5)
R. 27 E.
R. 28 E.
(Joins sheet 9)
TANQUE ROAD
Tanque
SAN SIMON
SAN SIMON VALLEY
SAN SIMON RIVER
SOUTHERN PACIFIC
Willow Spring Wash
30|29
31|32
34|35
3|2
1|6
12|7
18|17
19|20
29|28
32|33
1
10
12
13
20
21
23
38
40
(Joins sheet 16)

1 3/4 1/2 1/4 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

A 57.38:Sa 5 s

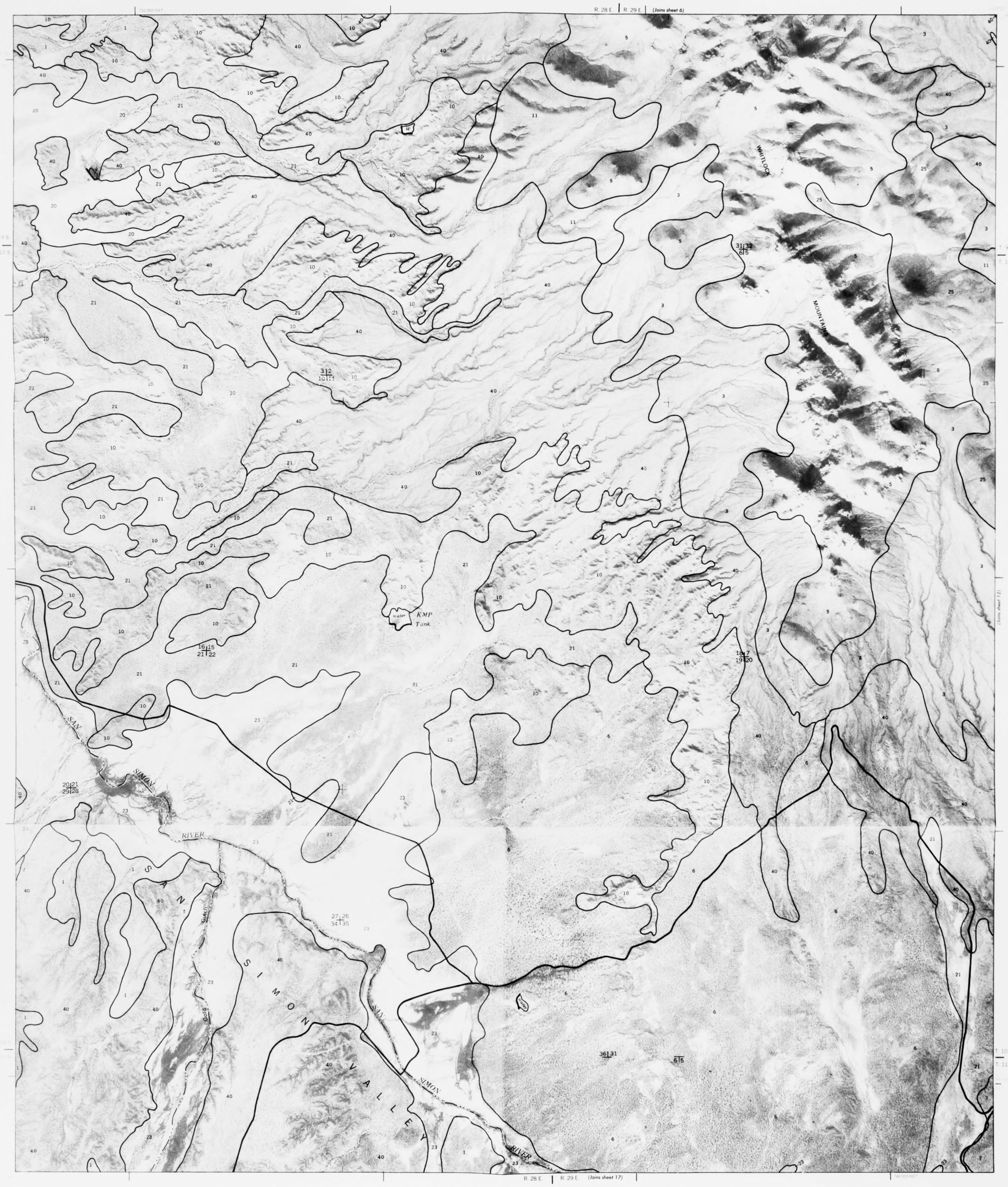
**US GOVERNMENT PUBLICATIONS** (depository)
Agriculture Dept. Soil Conservation Ser
Soil survey of San Simon area, AZ : parts of Cochise, Graham & Greenlee Counties by K.D. Vogt 1980

Mar 81-2142
4 of 7
10 maps

READEX
FICHE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 11
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(JAVELINA PEAK QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 6)
WHITLOCK
MOUNTAINS
KMP
Tank
water
SAN
SIMON
RIVER
SAN
SIMON
VALLEY
Gold Gulch
T. 9 S.
T. 10 S.
T. 11 S.
(Joins sheet 12)
(Joins sheet 17)

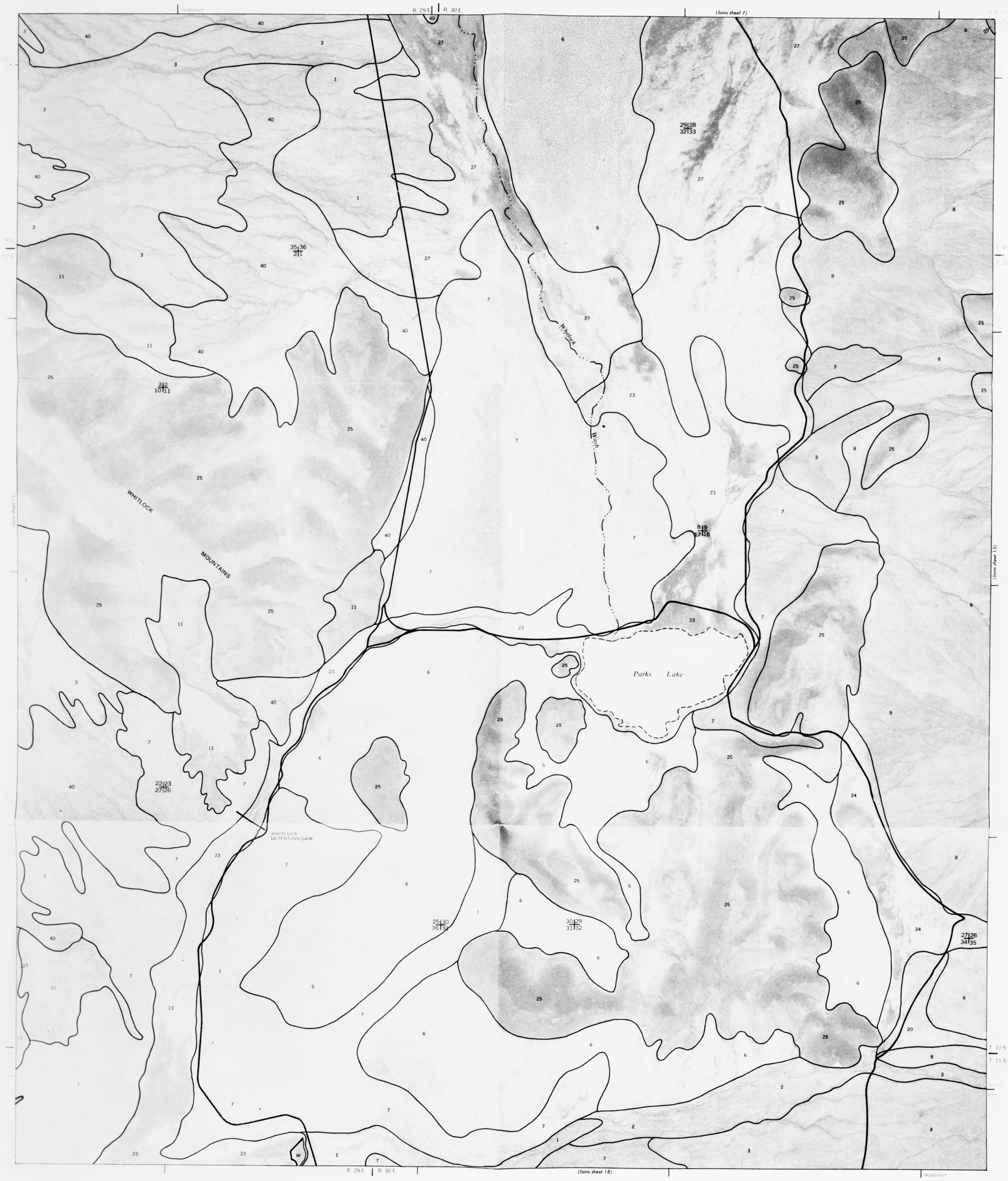
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1972 and 1973 aerial photography
by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(WHITLOCK CIENEGA QUADRANGLE)


R. 29 E.
R. 30 E.
(Joins sheet 7)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 18)
T. 9 S.
T. 10 S.
T. 11 S.
780 000 FEET
WHITLOCK MOUNTAINS
Whitlock Wash
Parks Lake
WHITLOCK DETENTION DAM
1
2
3
6
7
8
10
11
20
23
24
25
27
40
w

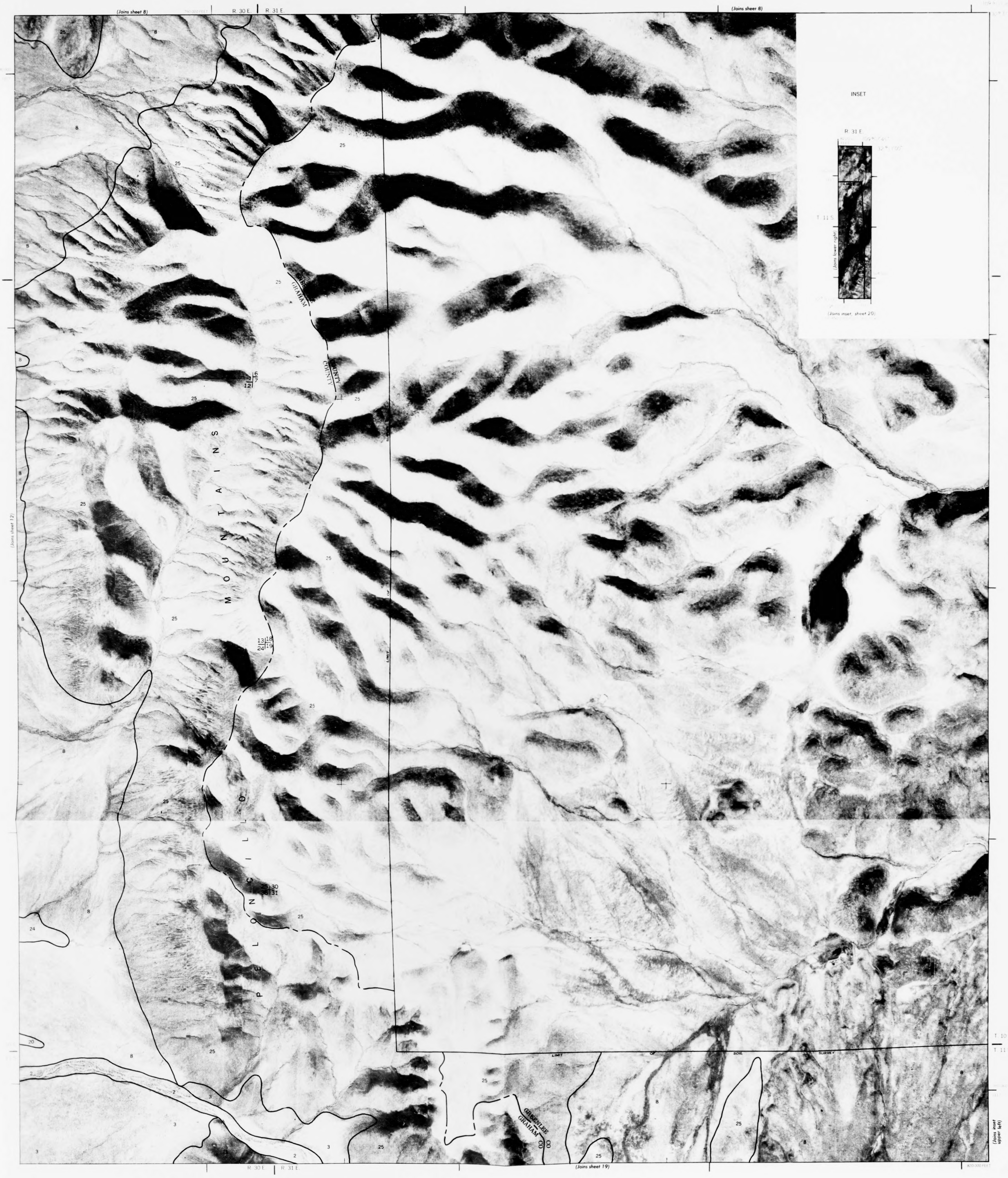
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 13
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(DUNCAN SW QUADRANGLE)


(Joins sheet 8)
R. 30 E.
R. 31 E.
(Joins sheet 8)
INSET
R. 31 E.
32°57'00"
T. 11 S.
(Joins lower right)
(Joins inset, sheet 20)
25
8
8
25
25
8
25
GRAHAM
COUNTY
8
6
7
12
25
25
MOUNTAINS
8
(Joins sheet 12)
25
25
25
8
13
24
18
19
25
8
25
PELONCILLO
30
31
8
25
24
20
8
25
2
3
3
3
2
3
25
LIMIT
LIMIT OF SOIL SURVEY
T. 10 S.
T. 11 S.
25
GREENLEE CO
GRAHAM CO
8
25
8
8
25
(Joins inset upper left)
R. 30 E.
R. 31 E.
(Joins sheet 19)
820 000 FEET

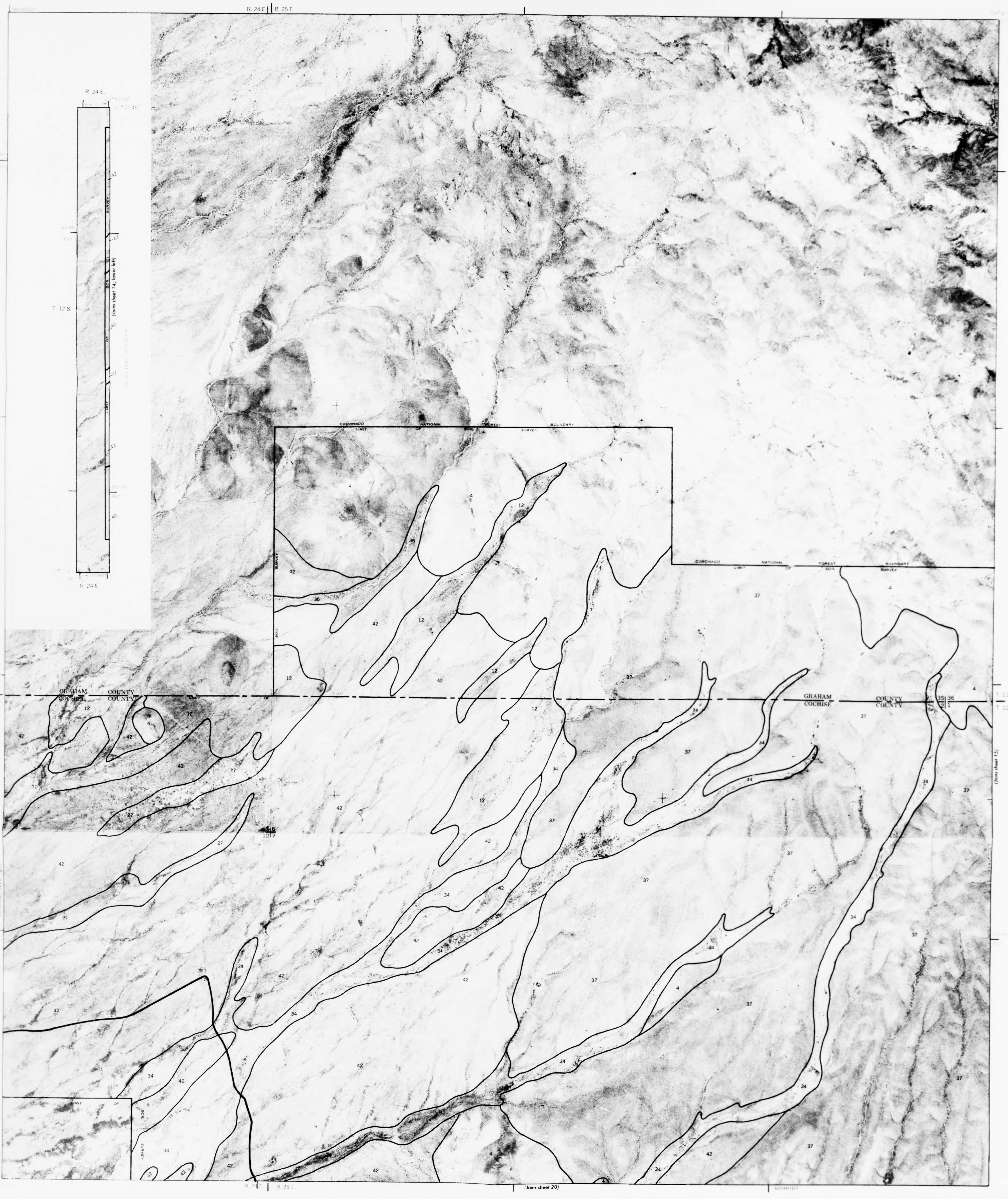
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 14
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(WILLCOX NE QUADRANGLE)

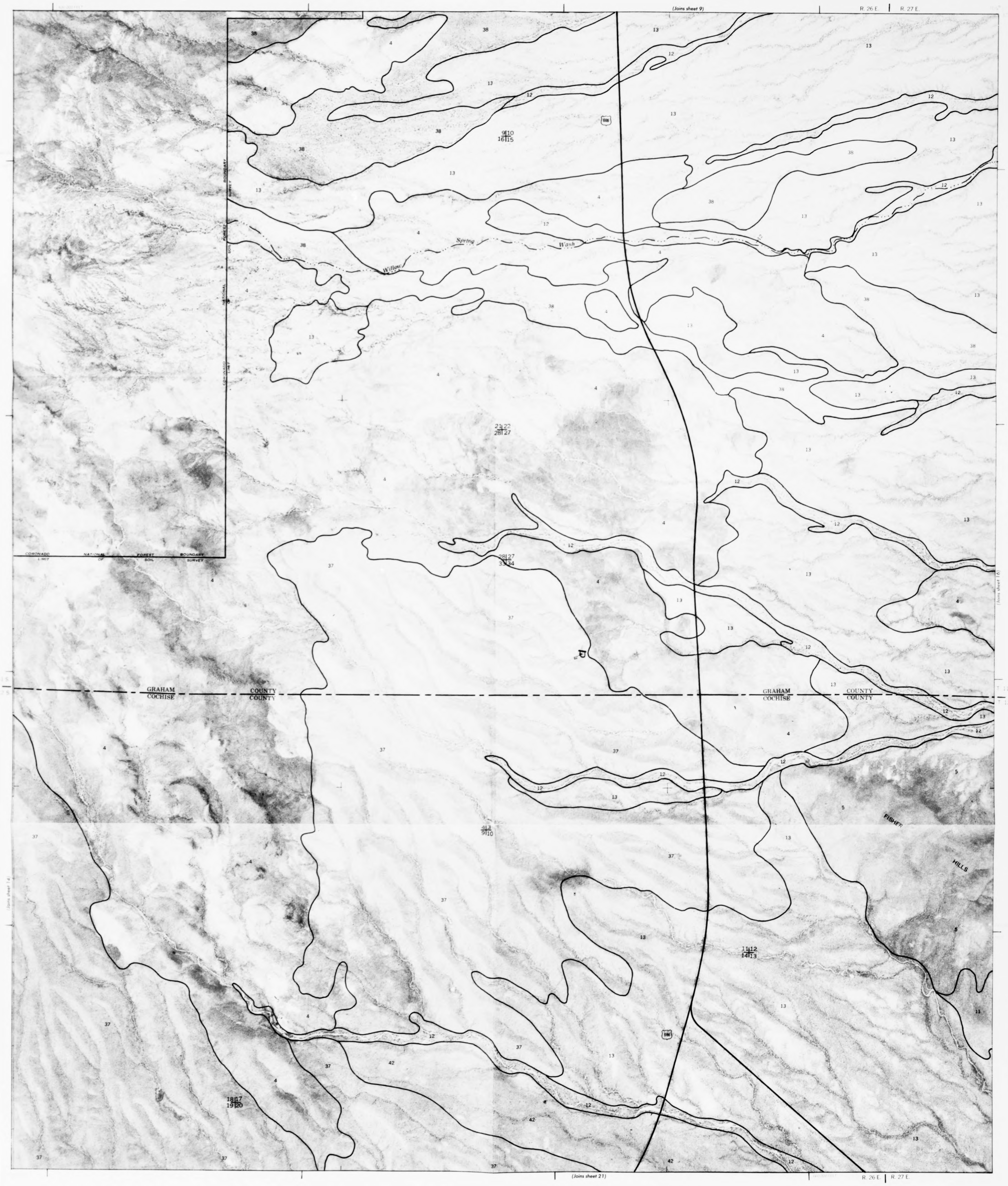

R. 24 E.
R. 25 E.
T. 12 S.
T. 11 S.
(Joins sheet 14, lower left)
(Joins sheet 15)
(Joins sheet 20)
CORONADO NATIONAL FOREST BOUNDARY
LIMIT OF SOIL SURVEY
GRAHAM COUNTY
COCHISE COUNTY
35 36
2 1
5 6
12 7
4
12
14
27
34
36
37
42
620 000 FEET
1 ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24 000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 15
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(LUZENA NW QUADRANGLE)


(Joins sheet 9)
R. 26 E.
R. 27 E.
38
4
13
12
866
9|10
16|15
Willow
Spring
Wash
CORONADO NATIONAL FOREST BOUNDARY
LIMIT OF SOIL SURVEY
21|22
28|27
28|27
33|34
37
(Joins sheet 16)
GRAHAM COUNTY
COCHISE COUNTY
T. 11 S.
T. 12 S.
5
FISHER HILLS
4|3
9|10
(Joins sheet 14)
11|12
14|13
11
42
18|17
19|20
(Joins sheet 21)
R. 26 E.
R. 27 E.

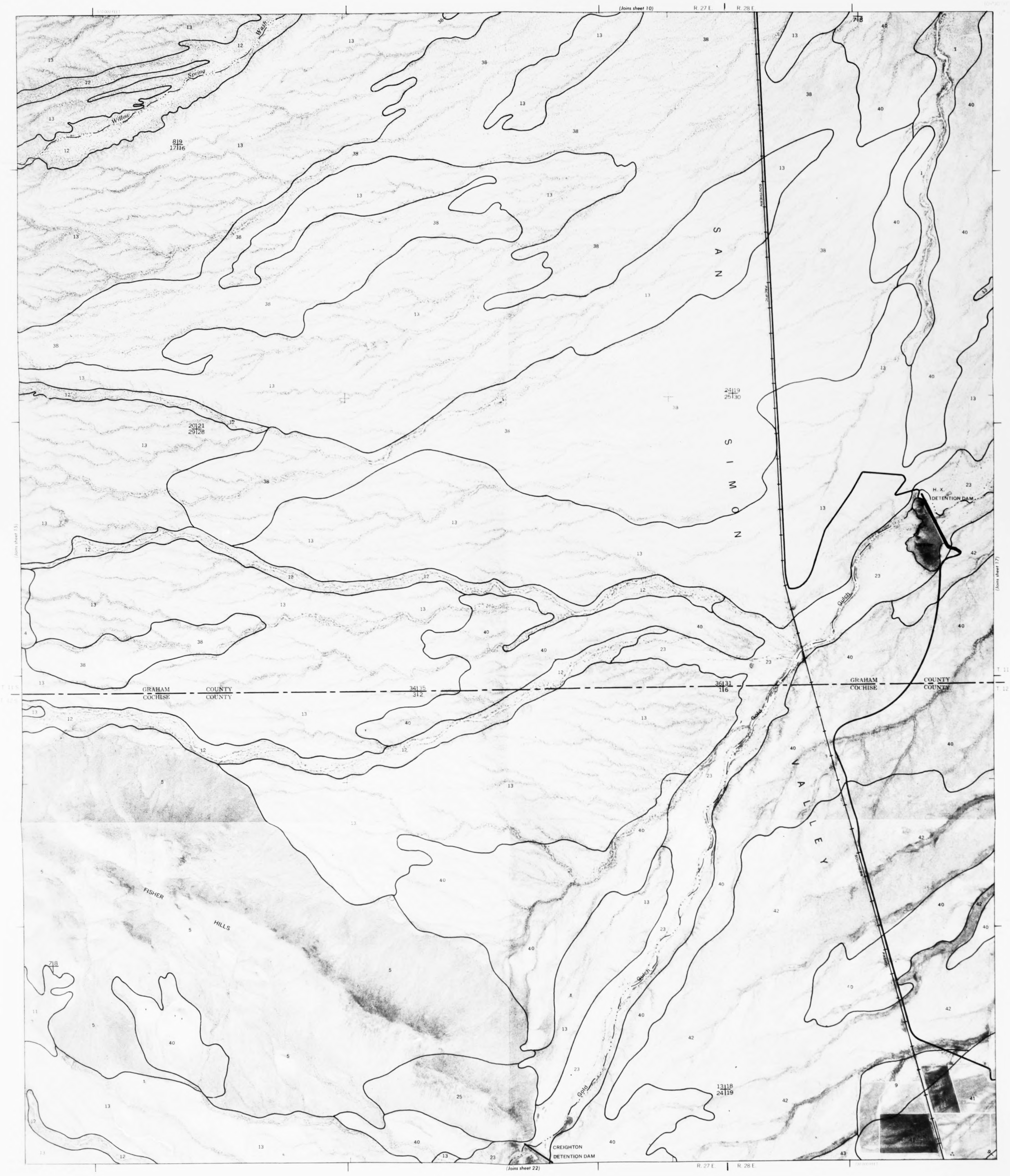
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 16
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(LUZENA NE QUADRANGLE)


(Joins sheet 10)
R. 27 E.
R. 28 E.
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 22)
Willow Spring Wash
SAN SIMON VALLEY
SOUTHERN PACIFIC
H. X. DETENTION DAM
Gold Gulch
GRAHAM COUNTY
COCHISE COUNTY
T. 11 S.
T. 12 S.
FISHER HILLS
CREIGHTON DETENTION DAM
8|9
17|16
24|19
25|30
20|21
29|28
34|35
3|2
36|31
1|6
7|8
13|18
24|19
1
4
5
9
12
13
23
25
38
40
41
42
43
200 000 FEET

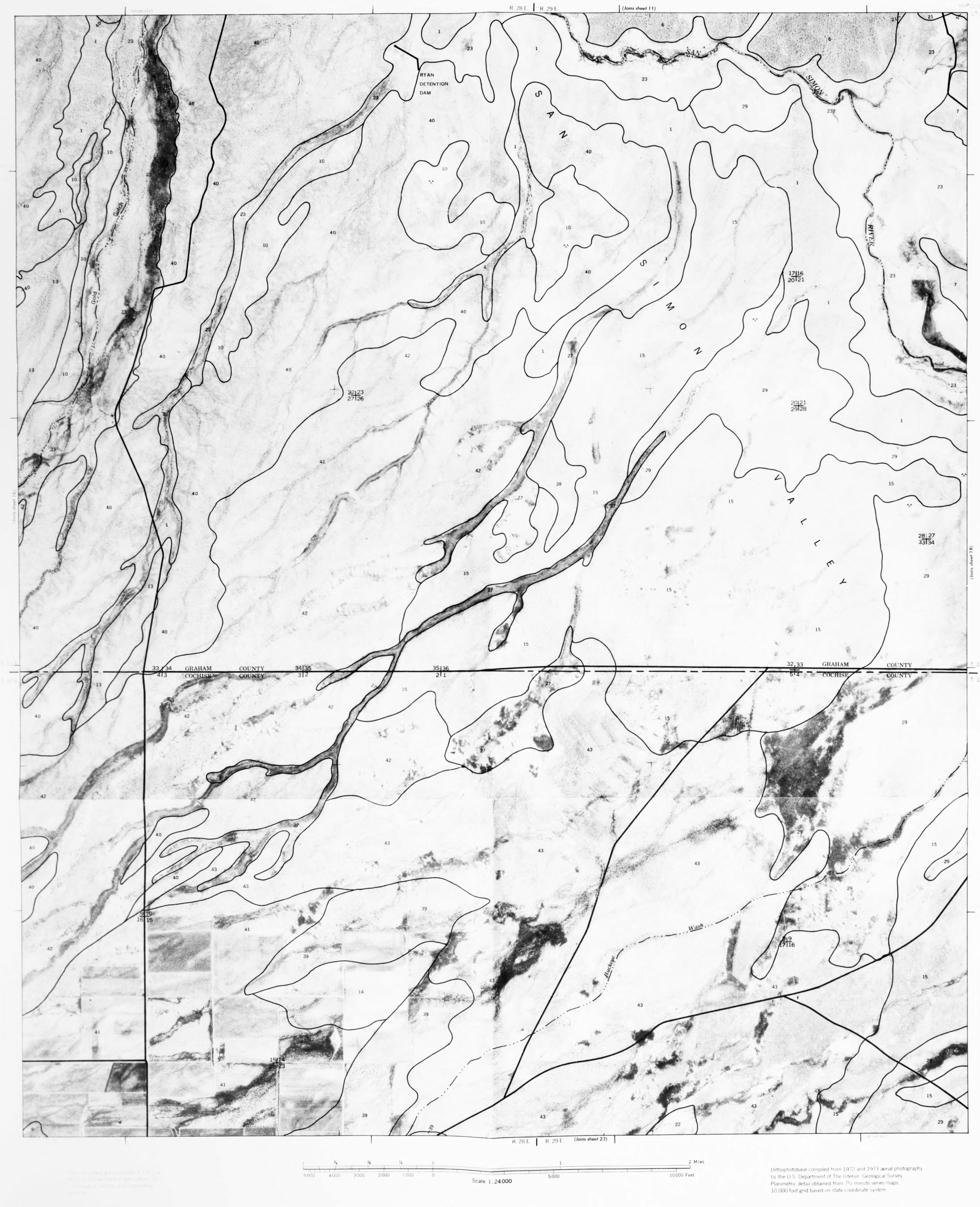
2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in [illegible] by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 17
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(BOWIE NW QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 11)
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 23)
RYAN
DETENTION
DAM
SAN SIMON VALLEY
SAN SIMON RIVER
Gold Gulch
Buckeye Wash
GRAHAM COUNTY
COCHISE COUNTY
T. 11 S.
T. 12 S.
22|23
27|26
17|16
20|21
20|21
29|28
28|27
33|34
33|34
4|3
34|35
3|2
35|36
2|1
32|33
5|4
9|10
16|15
8|9
17|16
15|14
22|23
1
6
10
13
14
15
21
22
23
27
29
38
39
40
41
42
43
Scale 1:24000
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet

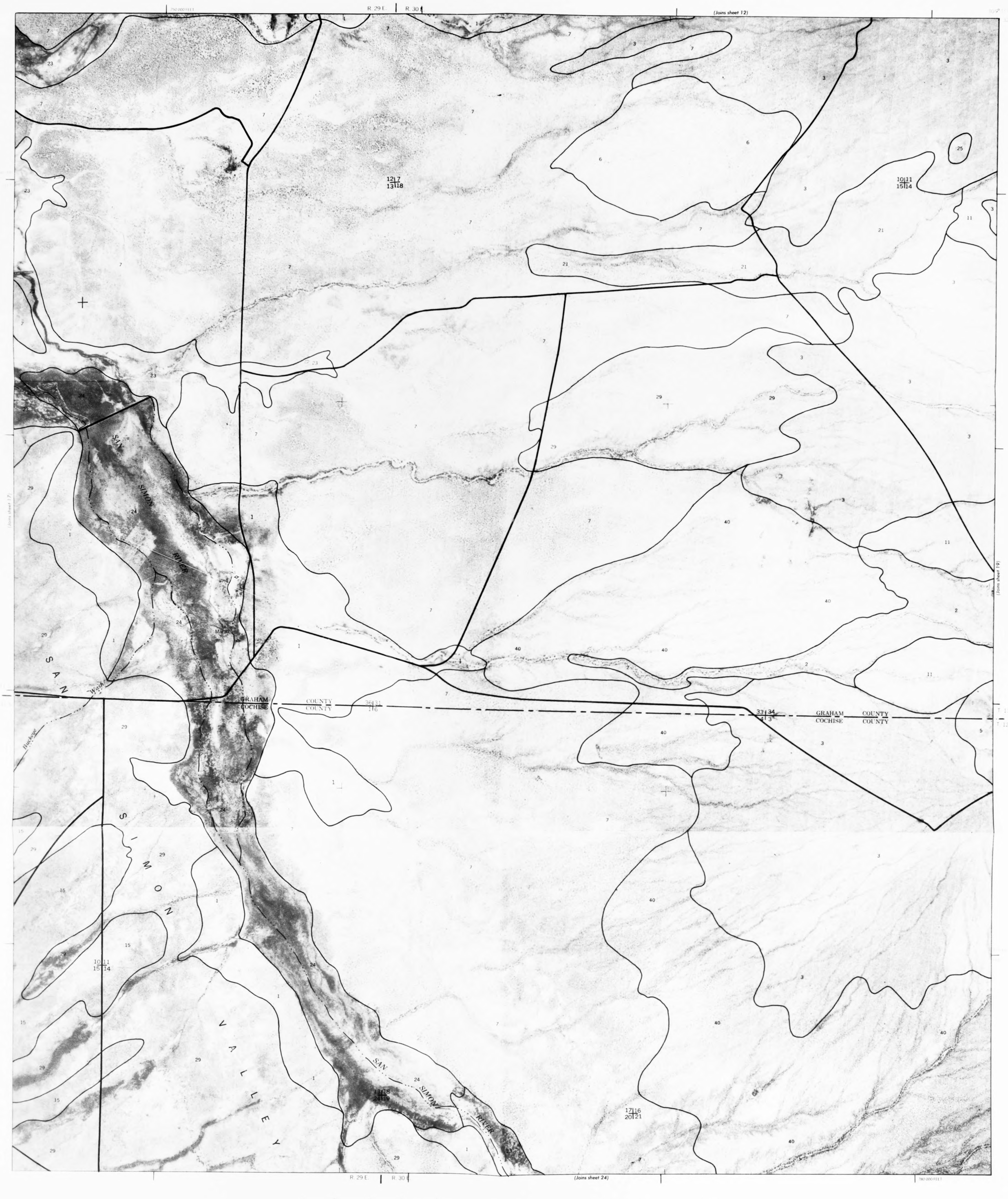
This soil survey was completed in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

SAN SIMON AREA, ARIZONA NO. 17

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 18
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(BOWIE NE QUADRANGLE)


750 000 FEET
R. 29 E.
R. 30 E.
(Joins sheet 12)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 24)
780 000 FEET
12|7
13|18
10|11
15|14
36|31
1|6
33|34
4|3
17|16
20|21
13|18
24|19
SAN SIMON RIVER
SAN SIMON VALLEY
Wash
GRAHAM COUNTY
COCHISE COUNTY
T. 11 S.
T. 12 S.
1
2
3
5
6
7
11
15
21
23
24
25
29
40

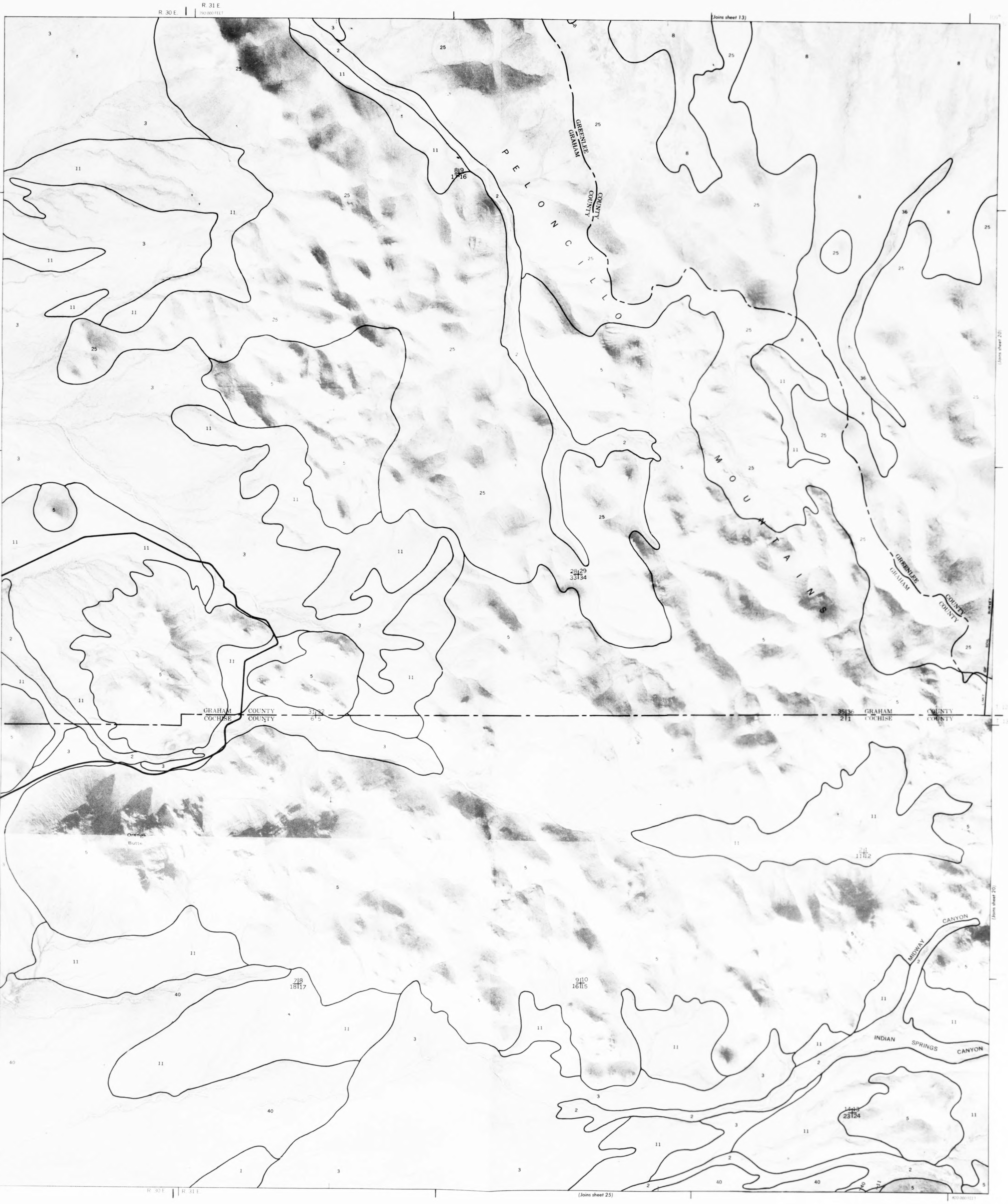
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography
by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 19
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(SAN SIMON NW QUADRANGLE)


R. 30 E.
R. 31 E.
790 000 FEET
(Joins sheet 13)
PELONCILLO MOUNTAINS
GREENLEE COUNTY
GRAHAM COUNTY
COCHISE COUNTY
Orange Butte
MIDWAY CANYON
INDIAN SPRINGS CANYON
(Joins sheet 20)
(Joins sheet 25)
820 000 FEET
3
25
2
11
8
36
5
1
40

Scale 1:24000
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

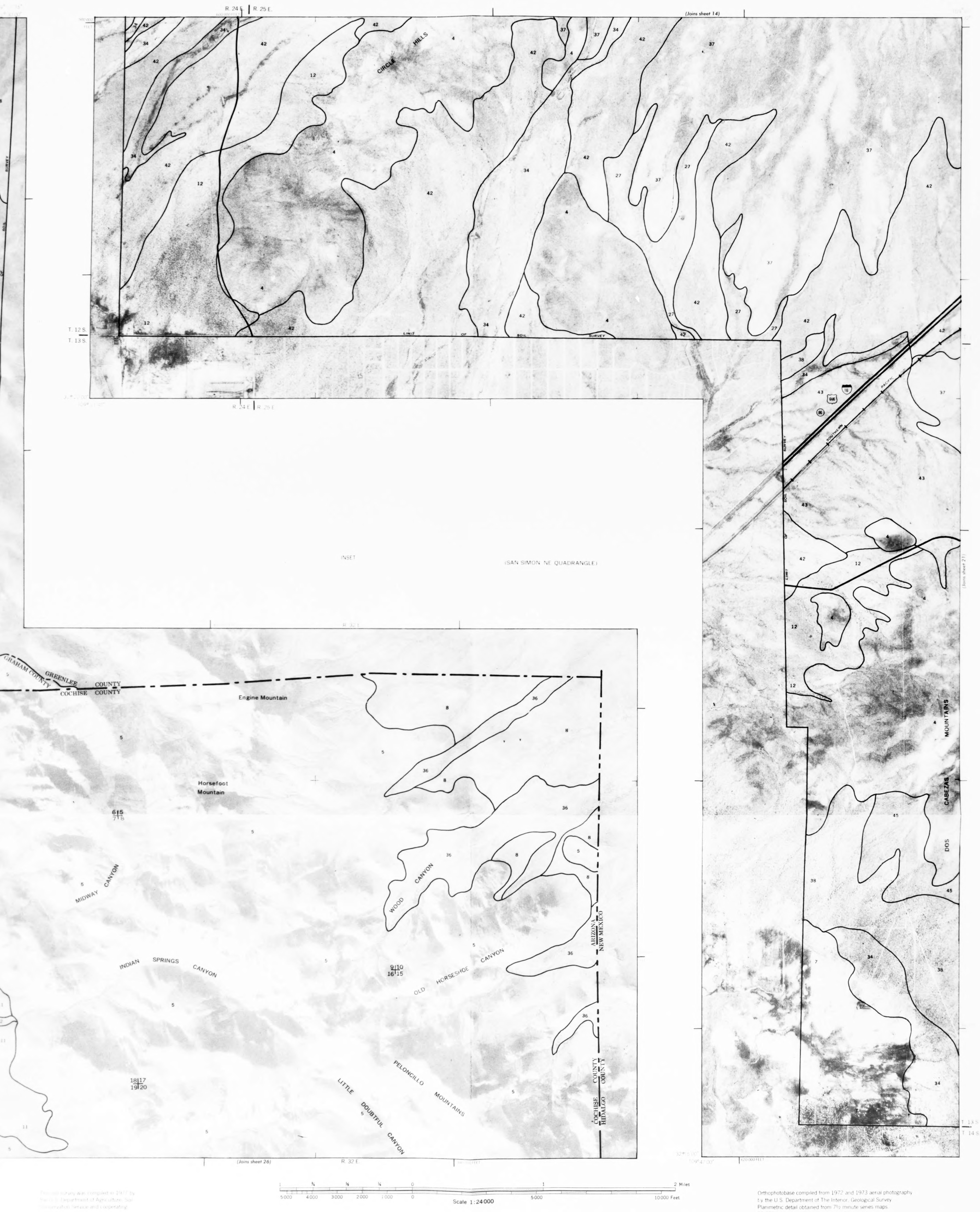
Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000 foot grid based on state coordinate system

SAN SIMON AREA, ARIZONA NO. 19

SHEET NO. 19 OF 41

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 20
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(WILLCOX SE QUADRANGLE)


R. 24 E.
R. 25 E.
(Joins sheet 14)
CIRCLE HILLS
LIMIT OF SOIL SURVEY
T. 12 S.
T. 13 S.
INSET
(SAN SIMON NE QUADRANGLE)
R. 32 E.
GRAHAM COUNTY
GREENLEE COUNTY
COCHISE COUNTY
Engine Mountain
Horsefoot Mountain
MIDWAY CANYON
WOOD CANYON
INDIAN SPRINGS CANYON
OLD HORSESHOE CANYON
ARIZONA
NEW MEXICO
PELONCILLO MOUNTAINS
LITTLE DOUBTFUL CANYON
COCHISE COUNTY
HIDALGO COUNTY
(Joins sheet 26)
(Joins sheet 21)
SOUTHERN PACIFIC
DOS CABEZAS MOUNTAINS
T. 13 S.
T. 14 S.
620 000 FEET
Scale 1:24000
1 Mile
2 Miles
5000 Feet
10 000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

A 57.38:Sa 5 s

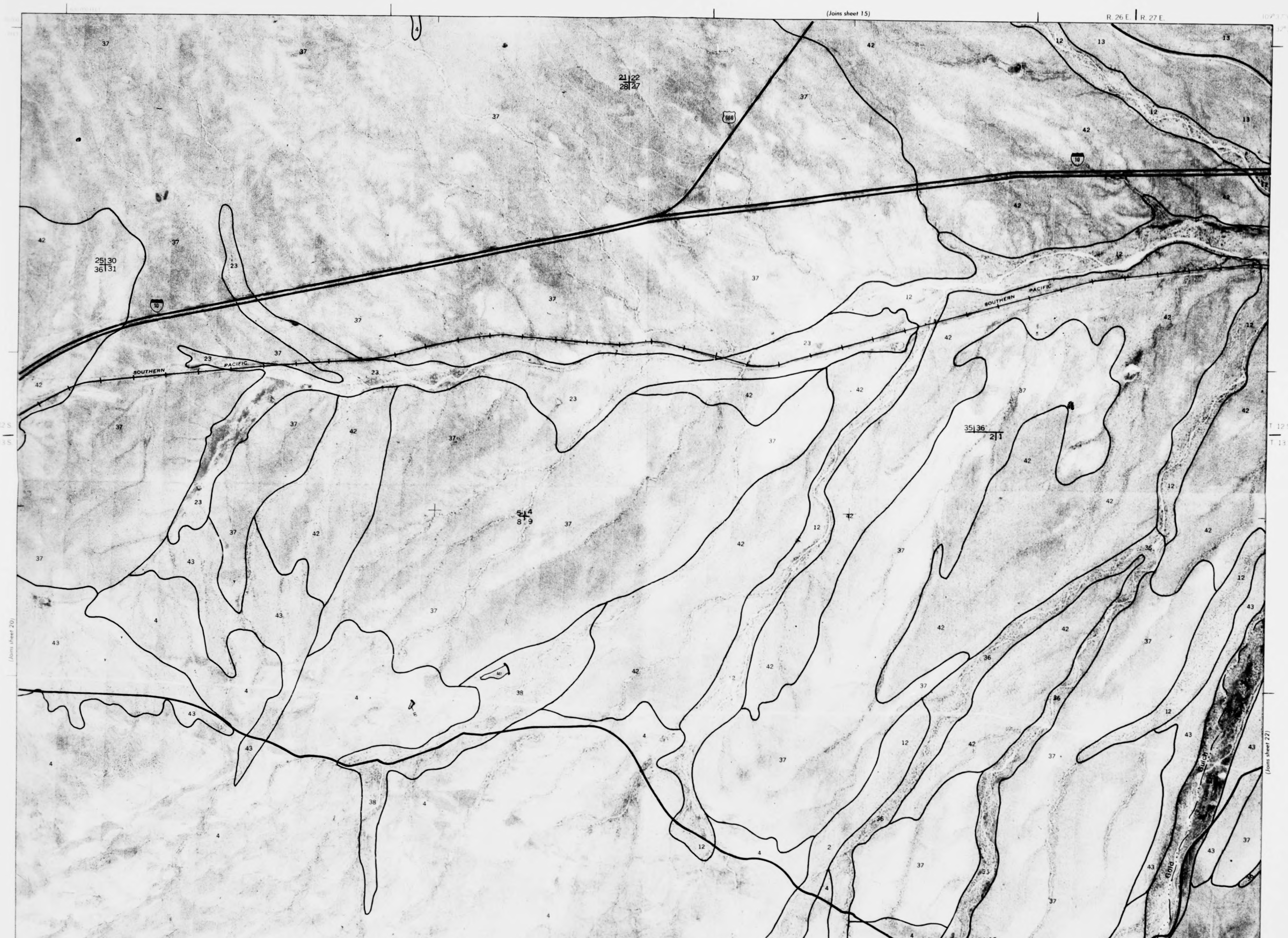
**US GOVERNMENT PUBLICATIONS** (depository)
Agriculture Dept. Soil Conservation Ser
Soil survey of SanSimon area, AZ : parts of Cochise, Graham & Greenlee Counties by K.D.Vogt 1980

Mar 81-2142
5 of 7
10 maps

READEX
FICHE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 21
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(LUZENA SW QUADRANGLE)


(Joins sheet 15)
R. 26 E.
R. 27 E.
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 27)
T. 12 S.
T. 13 S.
T. 14 S.
SOUTHERN PACIFIC
10
666
21 22
28 27
25 30
36 31
35 36
2 1
5 4
8 9
14 13
23 24
22 23
27 26
30 29
31 32
DOS CABEZAS MOUNTAINS
Gold Gulch
LIMIT OF SOIL SURVEY
660 000 FEET
37
42
12
13
23
43
4
38
36
2
16
18
31
32
34
45

Scale 1:24000
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet

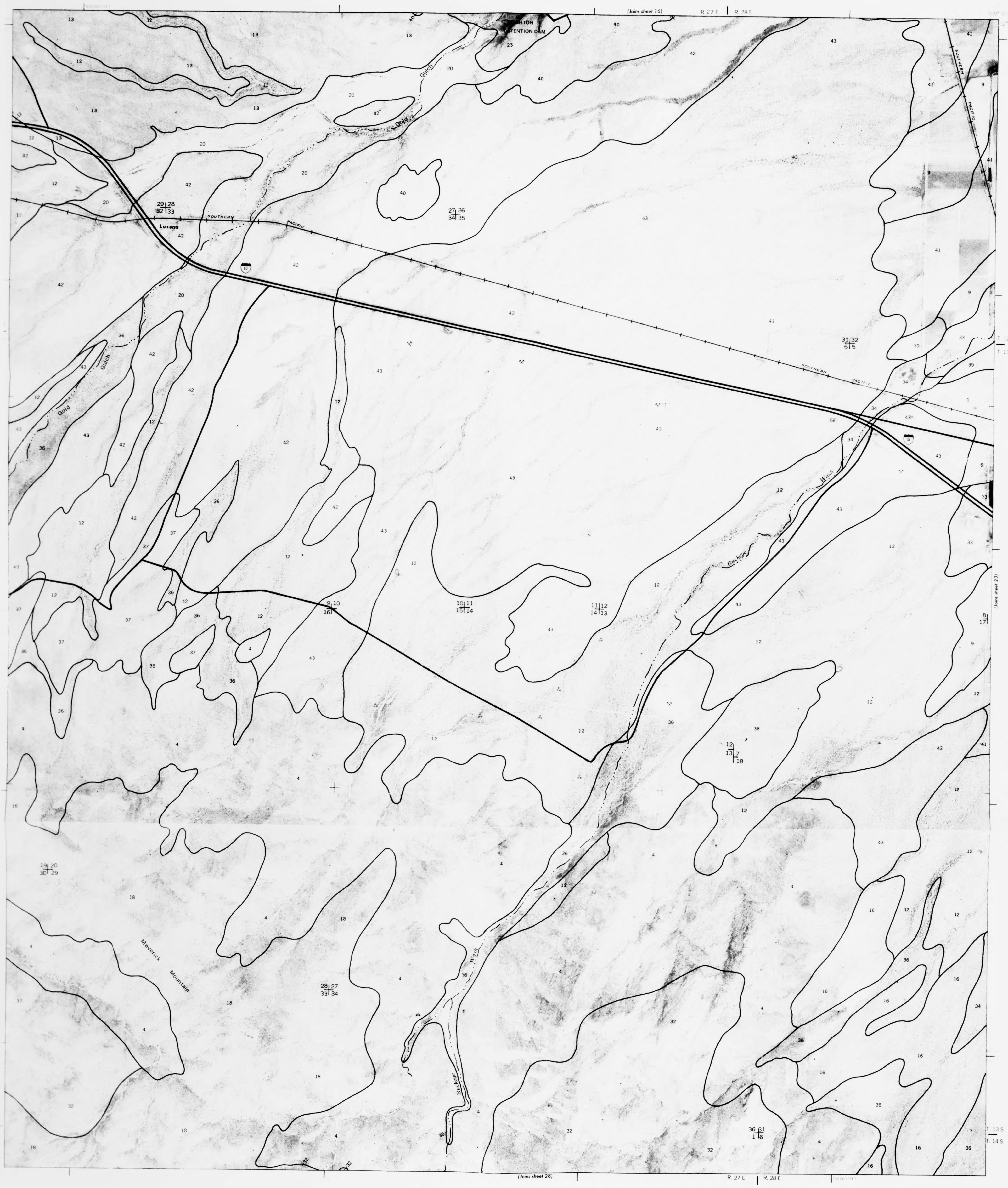
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

81-2142

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 22
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(LUZENA SE QUADRANGLE)


(Joins sheet 16)
R. 27 E.
R. 28 E.
LEIGHTON RETENTION DAM
Gold Gulch
Luzena
SOUTHERN PACIFIC
10
Buckeye Wash
Maverick Mountain
T. 12 S.
T. 13 S.
T. 14 S.
(Joins sheet 23)
(Joins sheet 28)
13
12
20
42
40
23
43
41
9
36
37
4
18
32
16
34
33
38
39
29 28
32 33
27 26
34 35
31 32
6 5
9 10
16
10 11
15 14
11 12
14 13
12
13 7
18
8
17
19 20
30 29
28 27
33 34
36 31
1 6

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

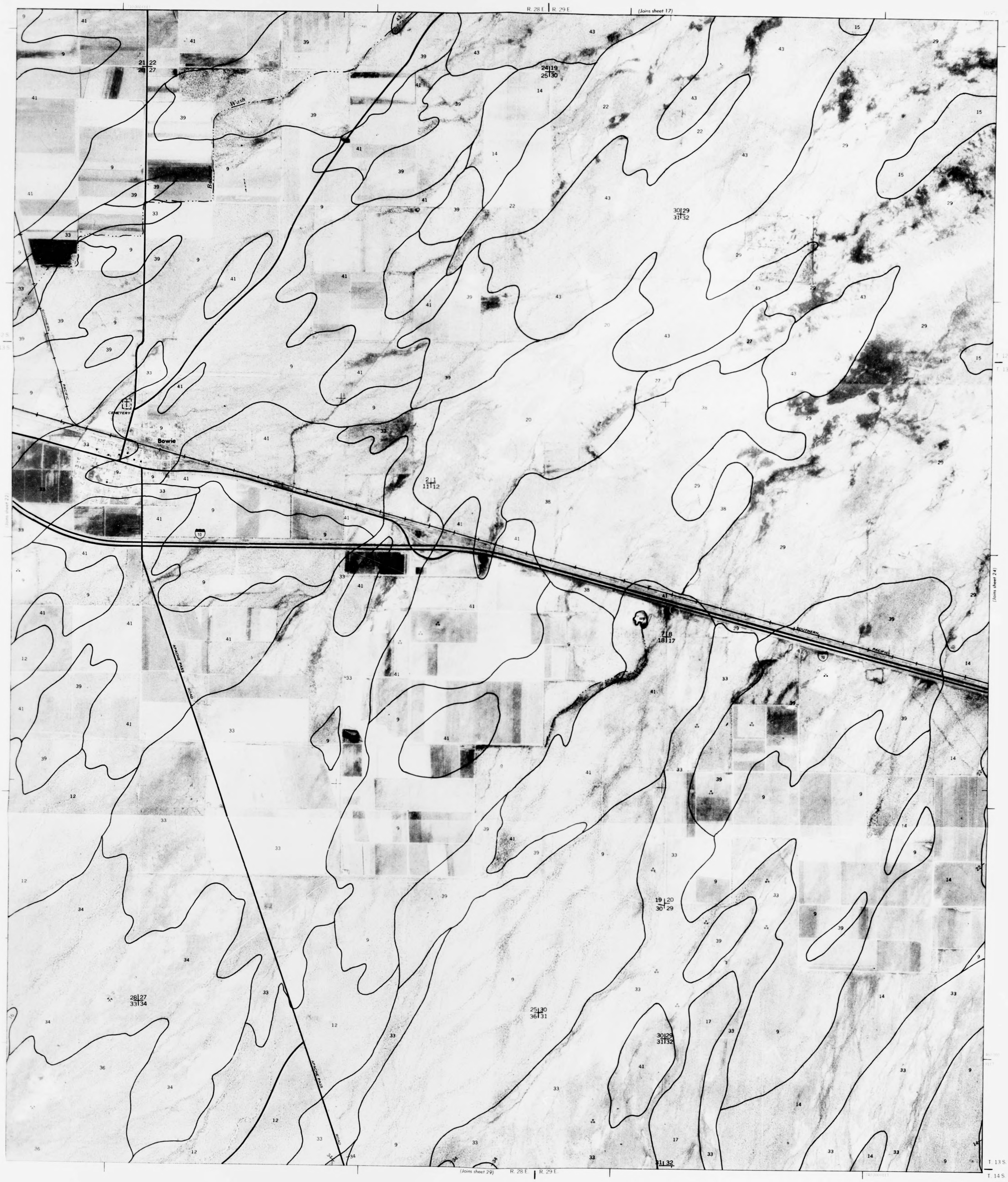
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

Cl-2142

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 23
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(BOWIE SW QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 17)
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 29)
T. 12 S.
T. 13 S.
T. 14 S.
Bowie
CEMETERY
Wash
SOUTHERN PACIFIC
APACHE PASS ROAD
10
21 22
28 27
24 19
25 30
30 29
31 32
2 1
11 12
7 8
18 17
19 20
30 29
25 30
36 31
28 27
33 34
31 32

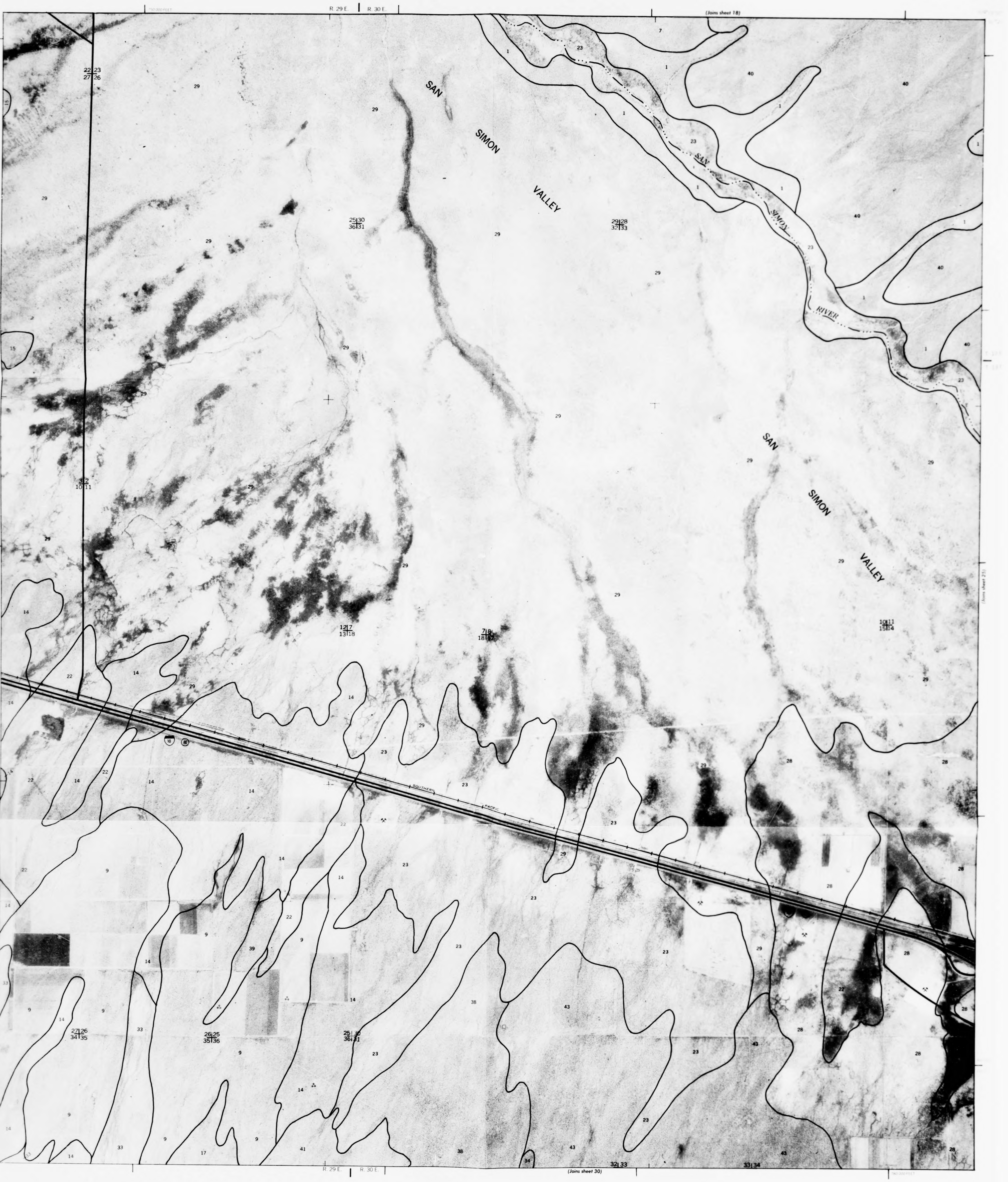
1 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

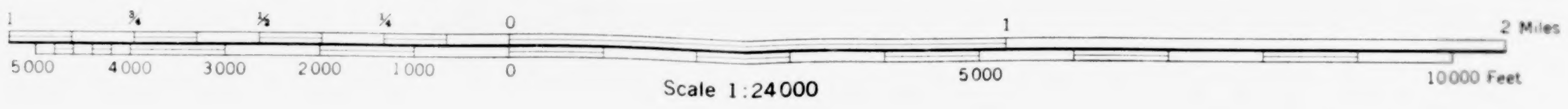
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

SAN SIMON AREA, ARIZONA NO. 23

SHEET NO. 23 OF 41


R. 29 E.
R. 30 E.
(Joins sheet 18)
SAN SIMON VALLEY
SAN SIMON RIVER
SAN SIMON VALLEY
SOUTHERN PACIFIC
10
86
22|23
27|26
25|30
36|31
29|28
32|33
3|2
10|11
12|7
13|18
7|8
18|17
10|11
15|14
27|26
34|35
26|25
35|36
25|30
36|31
(Joins sheet 25)
R. 29 E.
R. 30 E.
(Joins sheet 30)
32|33
33|34
760 000 FEET


1
¾
½
¼
0
1
2 Miles
5000
4000
3000
2000
1000
0
5000
10,000 Feet

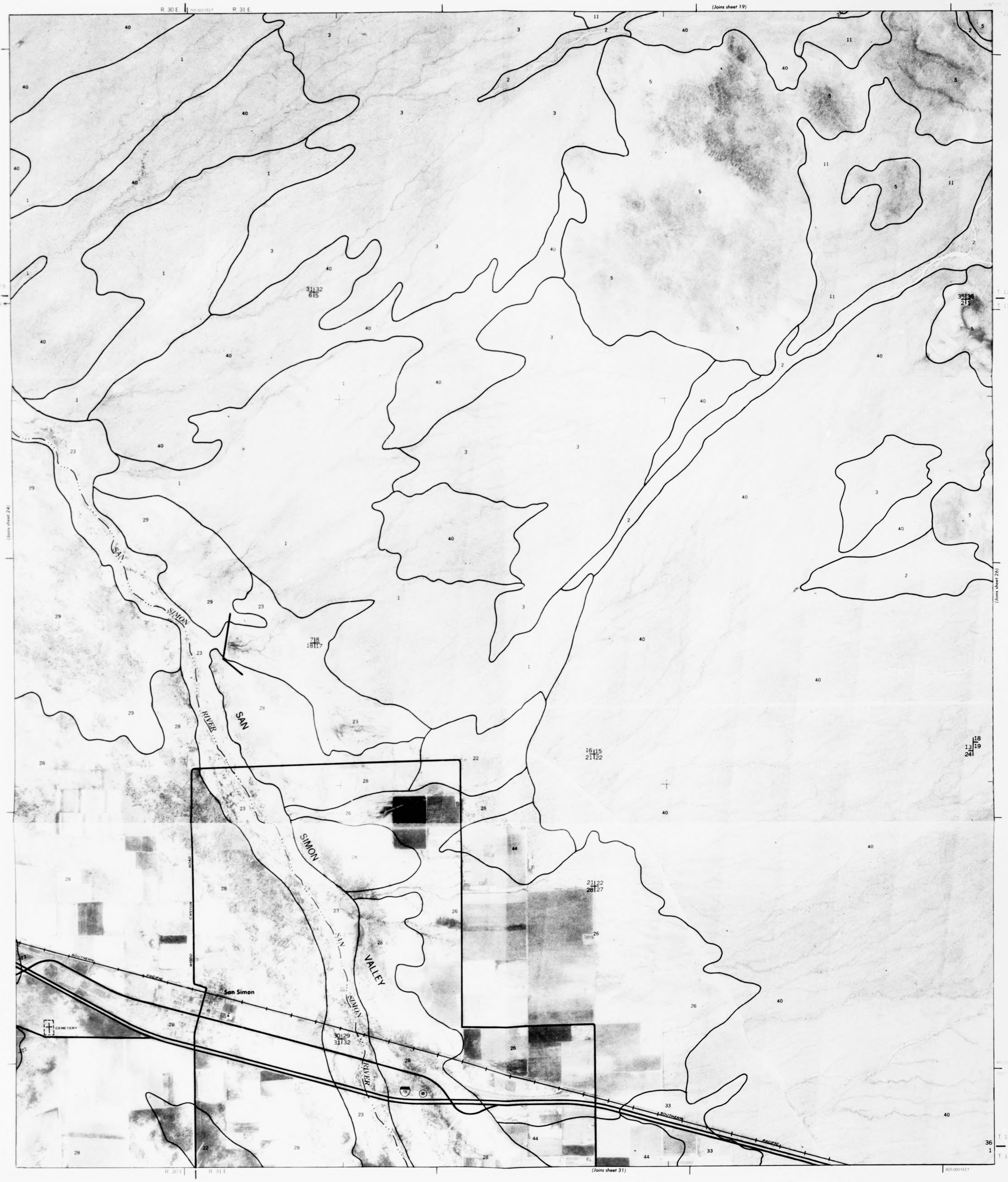
Scale 1:24000

This soil survey was compiled in 1977 by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography
by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 25
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(SAN SIMON SW QUADRANGLE)


R. 30 E.
R. 31 E.
720 000 FEET
(Joins sheet 19)
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 31)
T. 12 S.
T. 13 S.
T. 14 S.
820 000 FEET
SAN SIMON RIVER
SAN SIMON VALLEY
SAN SIMON RIVER
San Simon
SOUTHERN PACIFIC
CEMETERY
WOOD CANYON ROAD
1
2
3
5
11
22
23
26
28
29
33
40
44

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

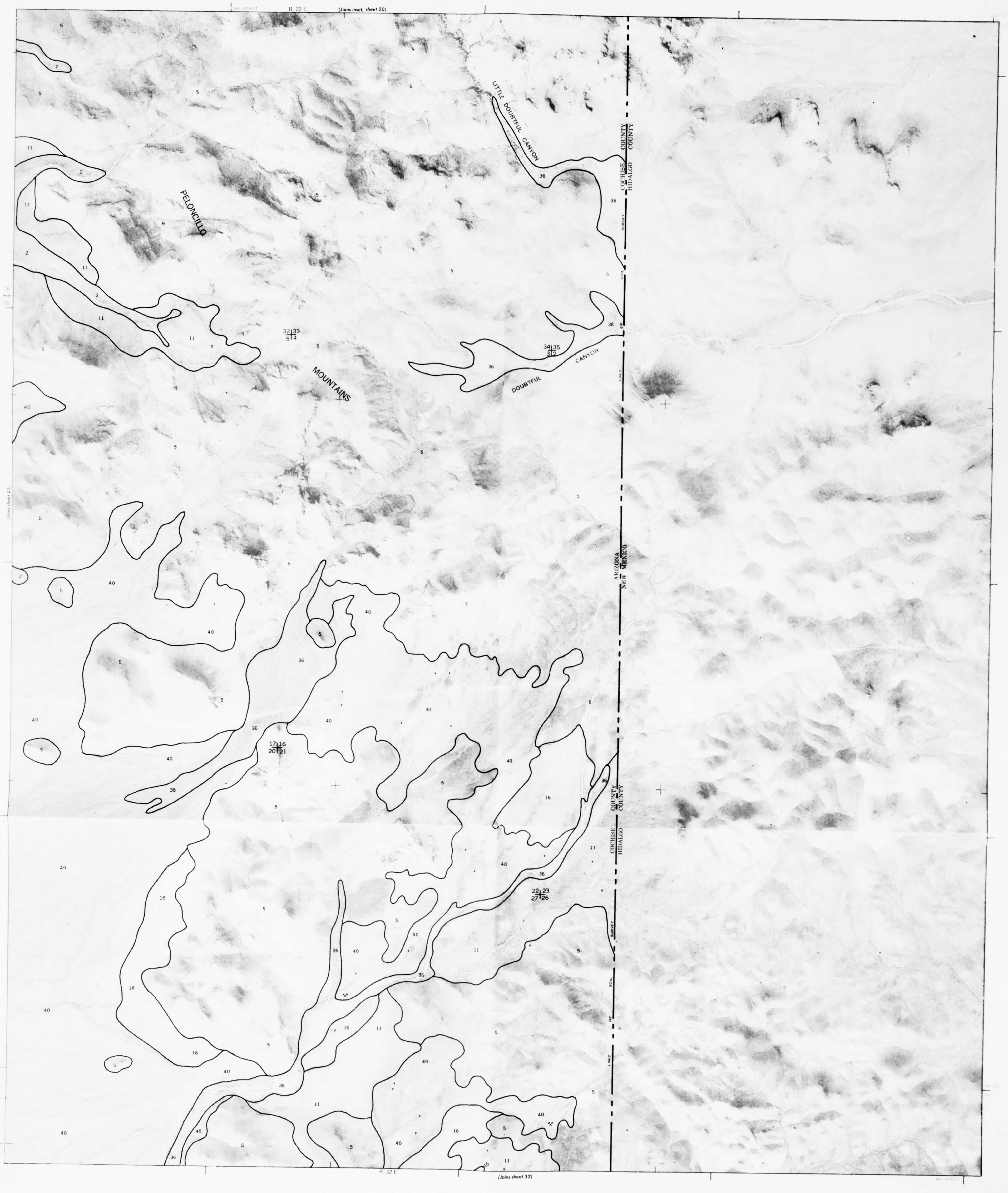
5000 4000 3000 2000 1000 0 5000 10000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 26
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(SAN SIMON SE QUADRANGLE)

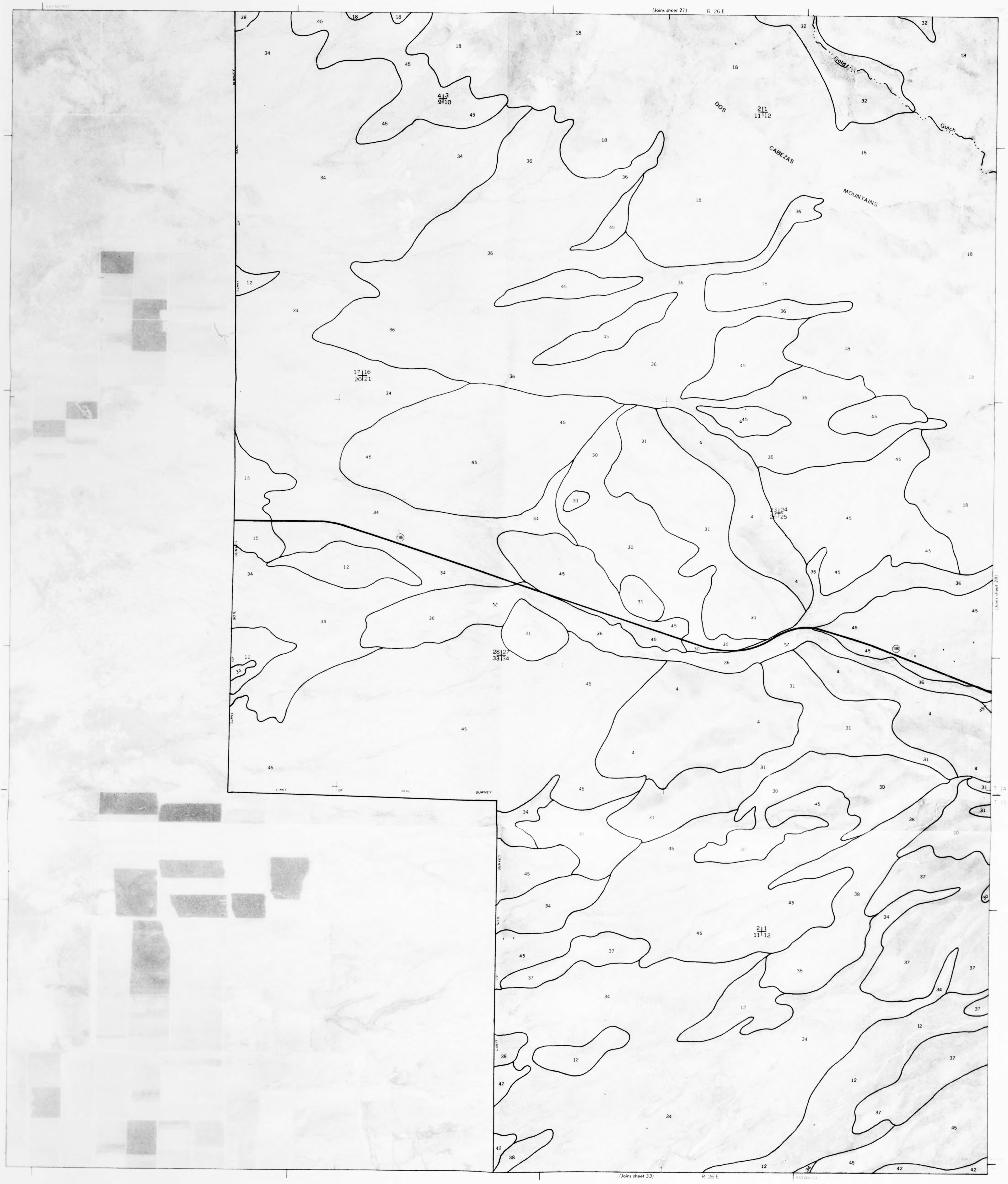

R. 32 E.
(Joins inset, sheet 20)
(Joins sheet 25)
(Joins sheet 32)
LITTLE DOUBTFUL CANYON
PELONCILLO
MOUNTAINS
DOUBTFUL CANYON
COCHISE COUNTY
HIDALGO COUNTY
ARIZONA
NEW MEXICO
SURVEY LIMIT
32 33
5 4
34 35
3 2
17 16
20 21
22 23
27 26
5
2
11
16
36
40
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 27
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(DOS CABEZAS NW QUADRANGLE)


(Joins sheet 21)
R. 26 E.
DOS CABEZAS MOUNTAINS
Gold Gulch
LIMIT OF SOIL SURVEY
(Joins sheet 28)
T. 14 S.
T. 15 S.
(Joins sheet 33)
R. 26 E.
660 000 FEET
4 3 9 10
2 1 11 12
17 16 20 21
23 24 26 25
28 27 33 34
2 1 11 12
38
45
18
34
32
36
12
15
30
31
4
37
42

Scale 1:24000
2 Miles
10 000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

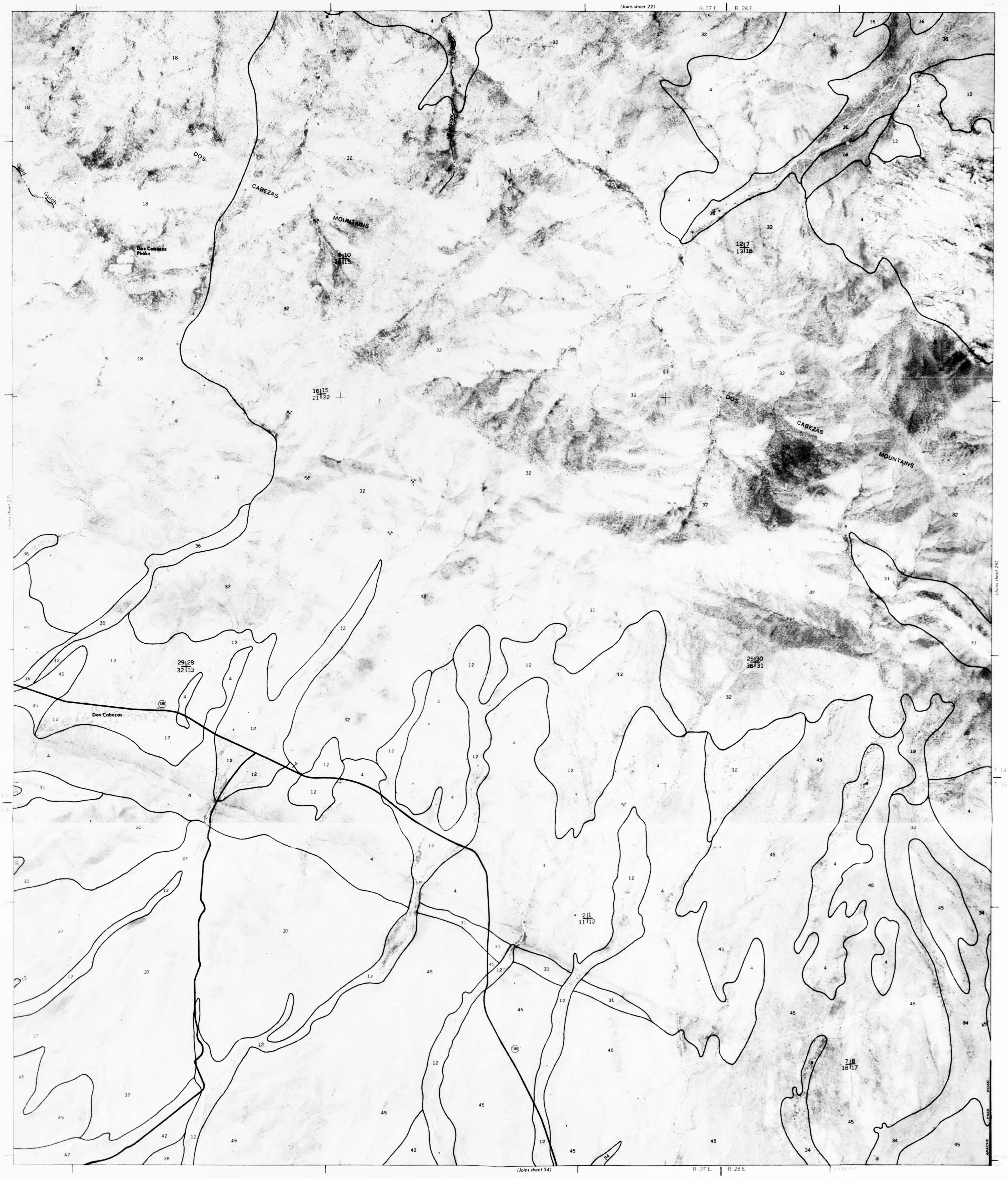
Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

SAN SIMON AREA, ARIZONA NO. 27

SHEET NO. 27 OF 41

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 28
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(DOS CABEZAS NE QUADRANGLE)


(Joins sheet 22)
R. 27 E.
R. 28 E.
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 34)
T. 14 S.
T. 15 S.
DOS CABEZAS MOUNTAINS
Dos Cabezas Peaks
Gold Gulch
Dos Cabezas
186
APACHE PASS ROAD
700 000 FEET
16|15
21|22
9|10
16|15
12|17
13|18
29|28
32|33
25|30
36|31
2|1
11|12
7|8
18|17
4
12
16
18
30
31
32
34
36
37
38
42
45

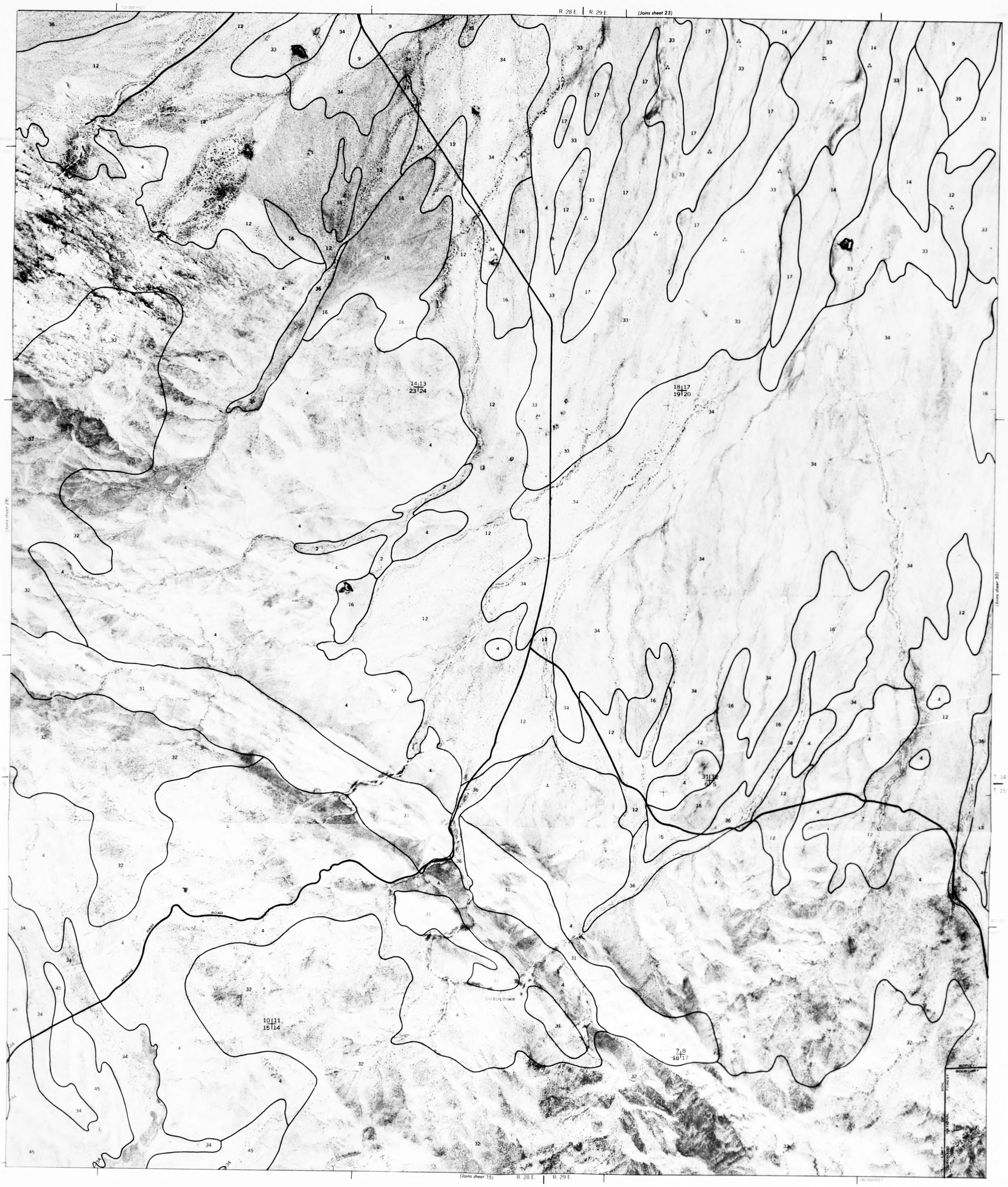
1 ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24 000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 29
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(COCHISE HEAD NW QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 23)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 35)
T. 14 S.
T. 15 S.
Old Fort Bowie
APACHE PASS ROAD
710 000 FEET
740 000 FEET
CORONADO NATIONAL FOREST
SOIL SURVEY BOUNDARY

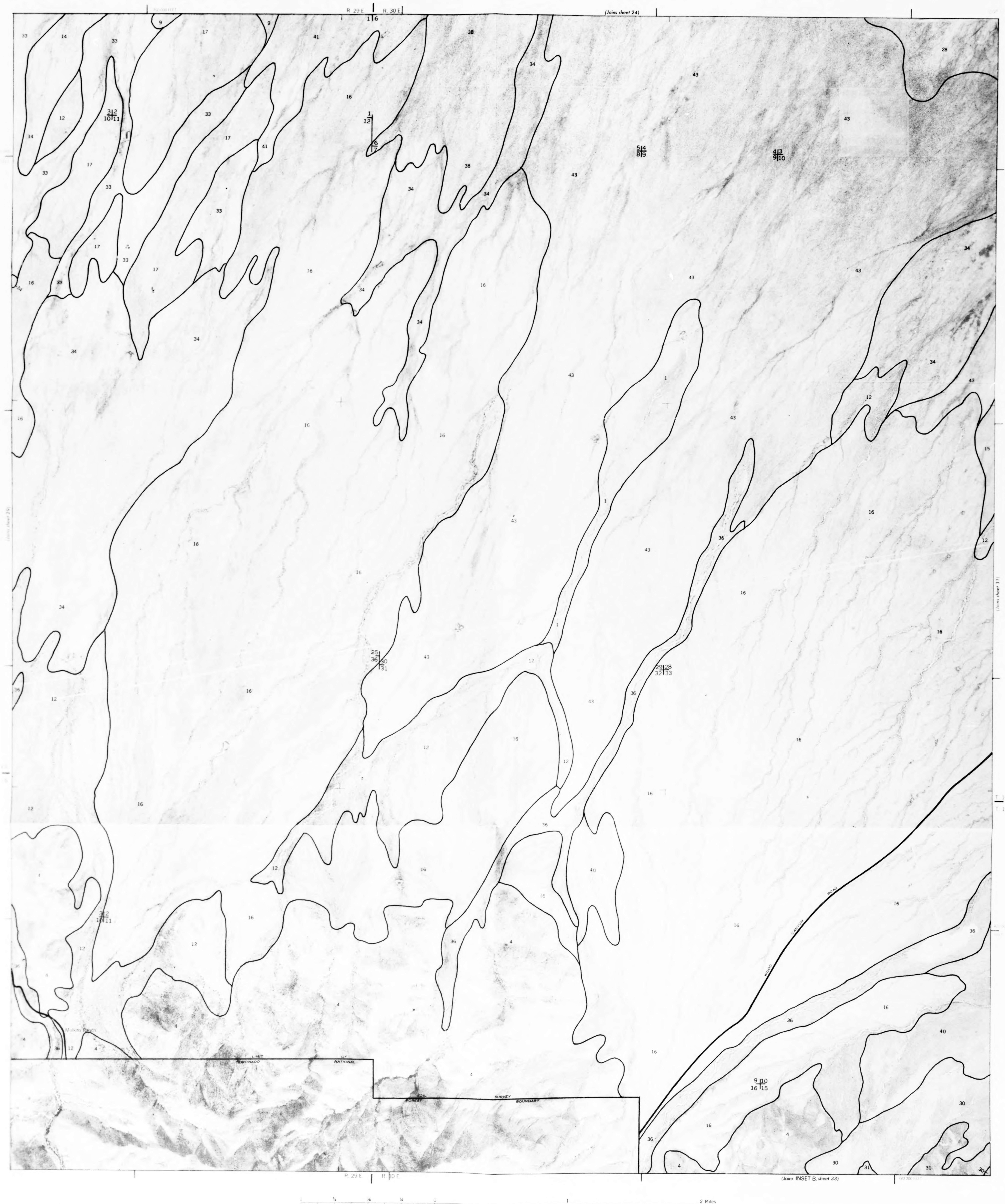
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 30
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(COCHISE HEAD NE QUADRANGLE)


(Joins sheet 24)
R. 29 E.
R. 30 E.
(Joins sheet 29)
(Joins sheet 31)
(Joins INSET B, sheet 33)
T. 14 S.
T. 15 S.
750 000 FEET
780 000 FEET
Mulkins Ranch
LIMIT OF CORONADO NATIONAL FOREST
SOIL SURVEY BOUNDARY
WOOD CANYON ROAD
43
16
34
33
17
12
36
1
4
40
38
41
28
30
31
14
15
9

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

A 57.38:Sa 5 s

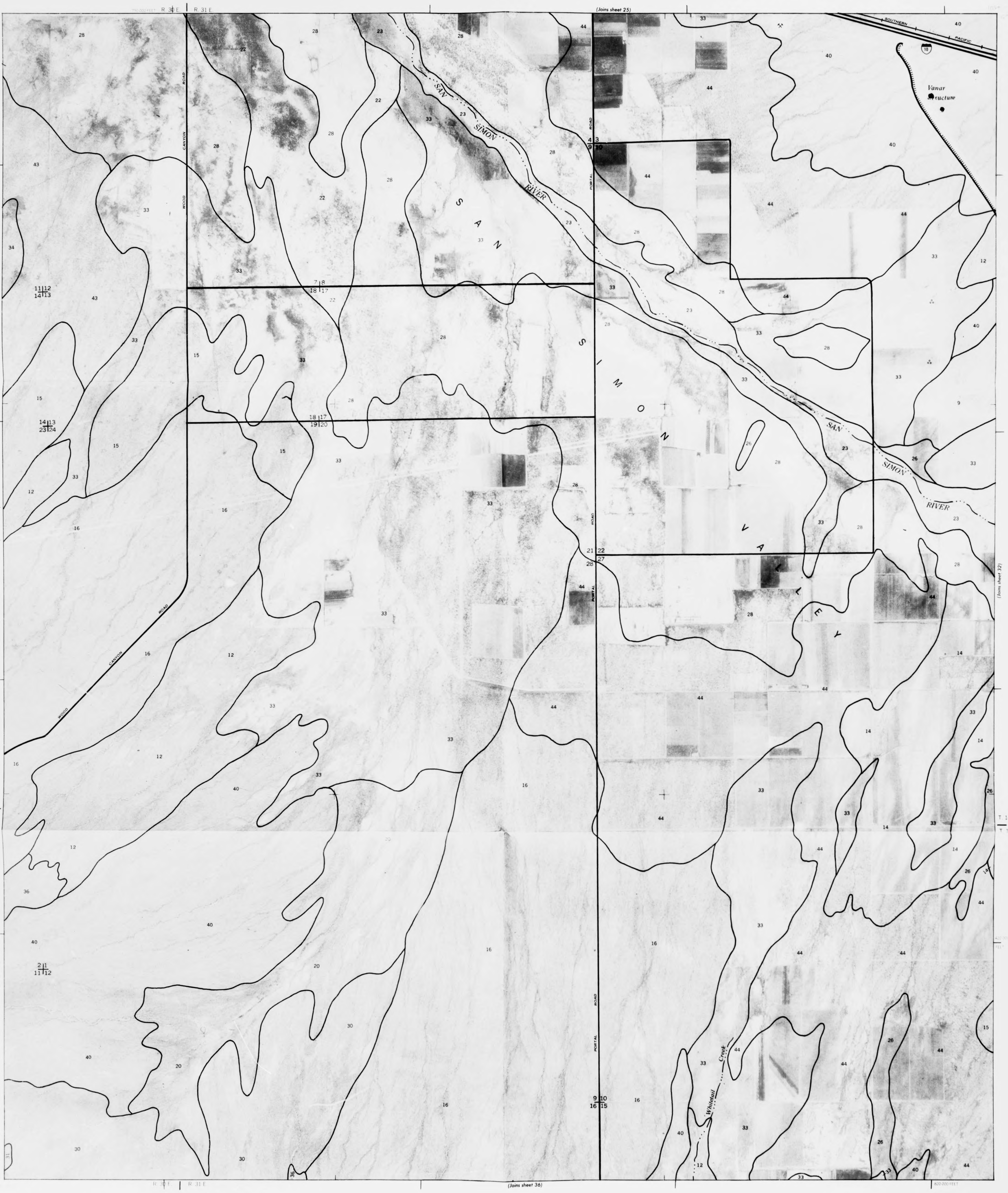
READEX
FICHE

**US GOVERNMENT PUBLICATIONS** (depository)
Agriculture Dept. Soil Conservation Ser
Soil survey of San Simon area, AZ : parts of Cochise, Graham & Greenlee Counties by K.D. Vogt 1980

Mar 81-2142
6 of 7
10 maps

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 31
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(VANAR NW QUADRANGLE)


R. 30 E.
R. 31 E.
(Joins sheet 25)
SOUTHERN PACIFIC
10
Vanar Structure
WOOD CANYON ROAD
PORTAL ROAD
SAN SIMON RIVER
SAN SIMON VALLEY
Whitetail Creek
T. 14 S.
T. 15 S.
(Joins sheet 32)
(Joins sheet 36)
820 000 FEET

Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

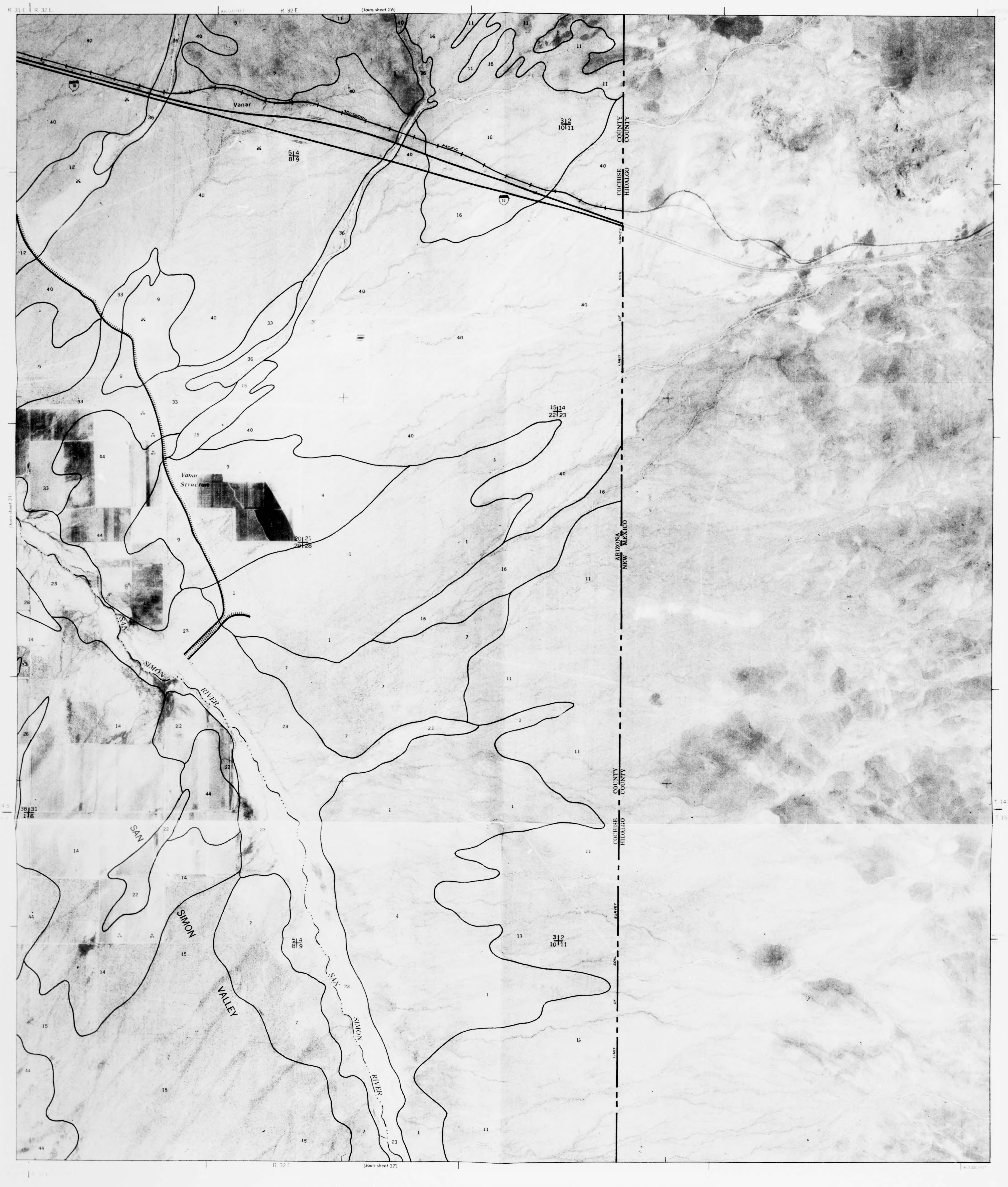
SAN SIMON AREA, ARIZONA NO. 31

SHEET NO. 31 OF 41

Cl-2142

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 32
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(VANAR NE QUADRANGLE)


(Joins sheet 26)
(Joins sheet 37)
(Joins sheet 31)
R. 31 E.
R. 32 E.
T. 14 S.
T. 15 S.
Vanar
SOUTHERN PACIFIC
10
Vanar Structure
SAN SIMON RIVER
SAN SIMON VALLEY
COCHISE COUNTY
HIDALGO COUNTY
ARIZONA
NEW MEXICO
LIMIT OF SOIL SURVEY
1
5
7
9
11
12
14
15
16
22
23
26
28
33
36
40
44
860 000 FEET

This soil survey map was compiled in 1976 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

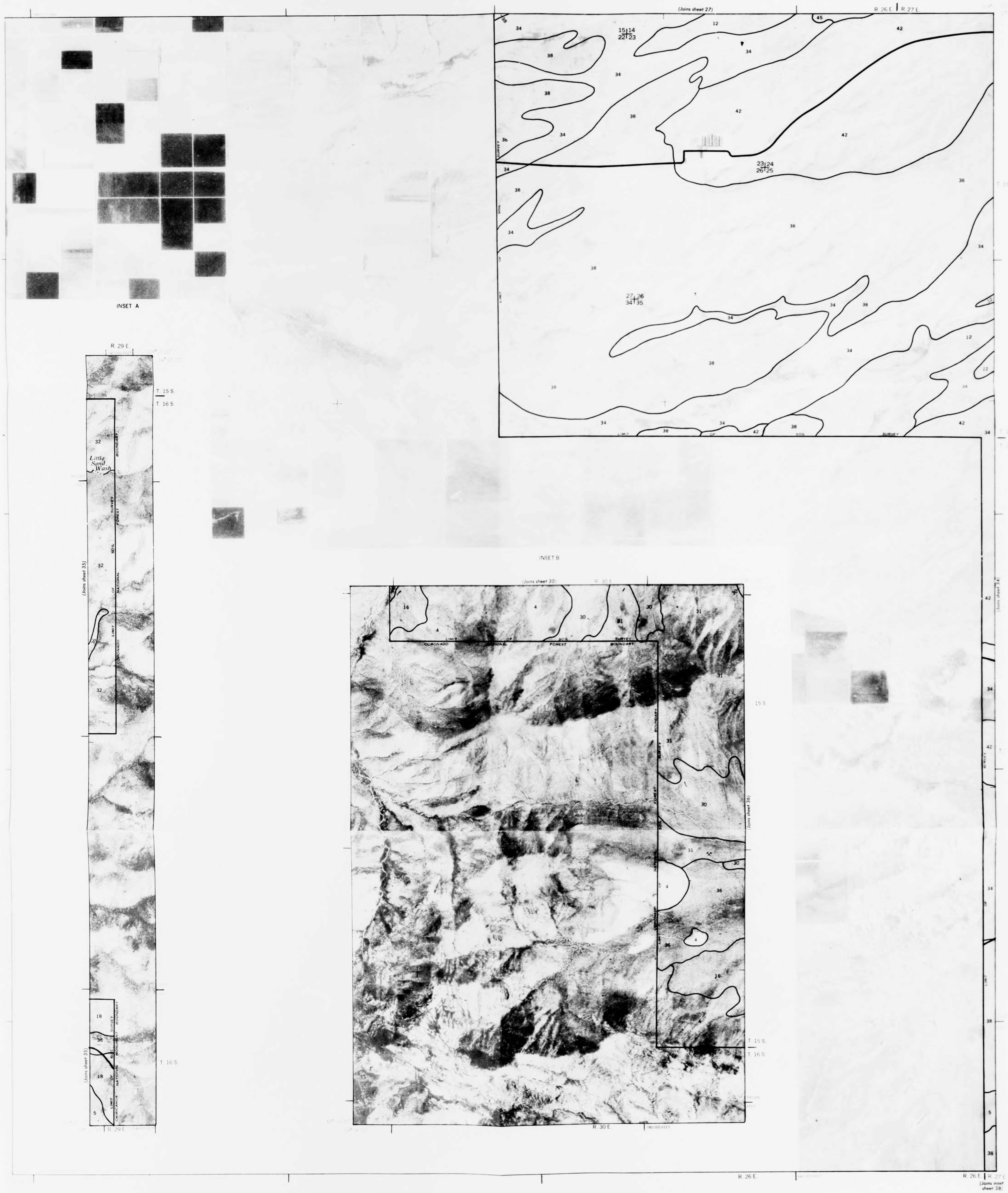
5000 4000 3000 2000 1000 0 5000 10 000 Feet

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000 foot grid based on state coordinate system.

SAN SIMON AREA, ARIZONA NO. 32

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 33
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(DOS CABEZAS SW QUADRANGLE)


(Joins sheet 27)
R. 26 E.
R. 27 E.
15 14
22 23
23 24
26 25
27 26
34 35
12
34
38
42
45
3b
34
38
LIMIT OF SOIL SURVEY
INSET A
INSET B
(Joins sheet 30)
R. 30 E.
LIMIT OF CORONADO NATIONAL FOREST SOIL SURVEY BOUNDARY
16
4
30
31
36
15 S.
T. 15 S.
T. 16 S.
(Joins sheet 36)
(Joins sheet 34)
R. 29 E.
T. 15 S.
T. 16 S.
32
Little Sand Wash
(Joins sheet 35)
18
5
5
38
R. 26 E.
R. 27 E.
(Joins inset sheet 38)

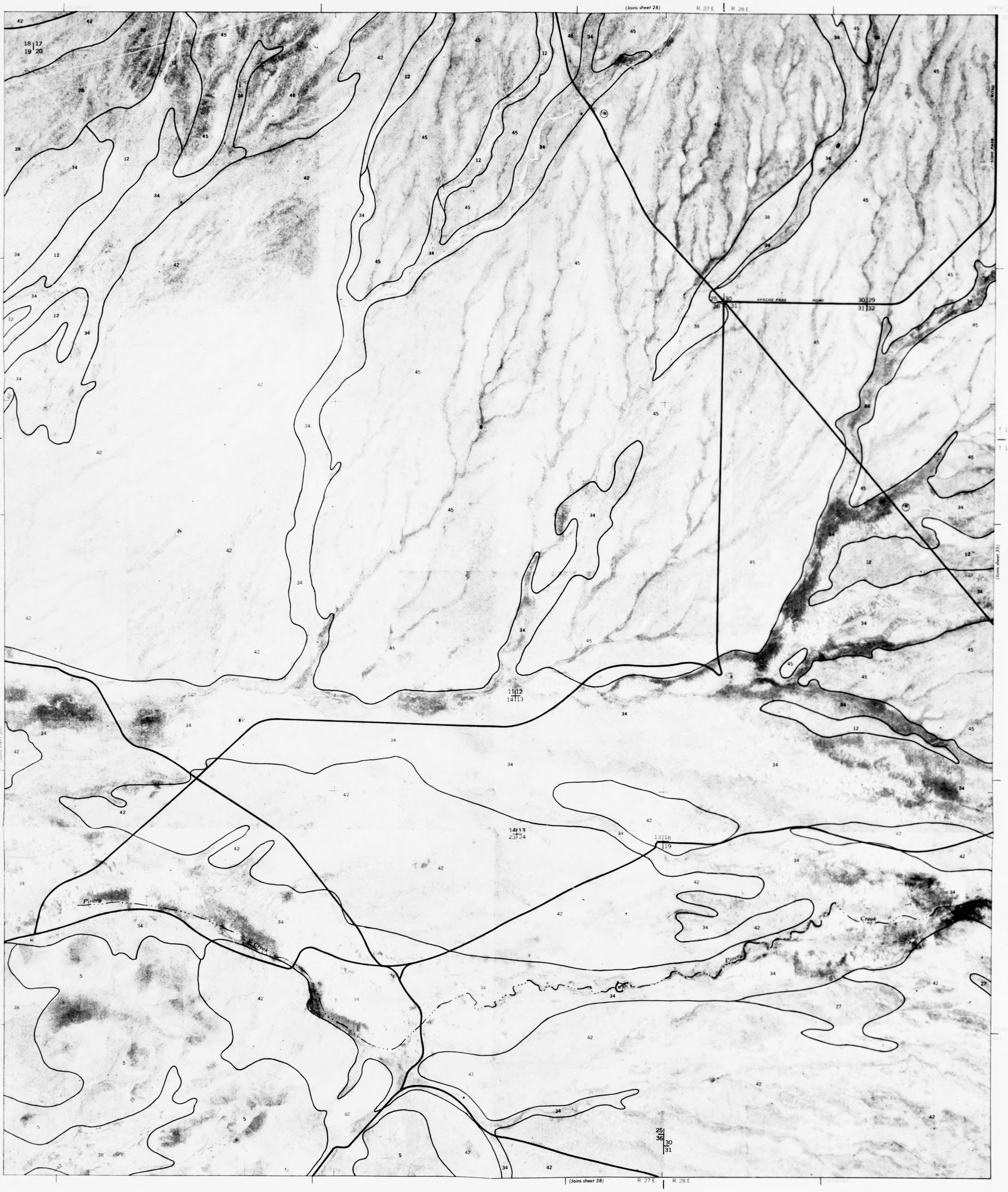
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Scale 1:24 000

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 34
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(DOS CABEZAS SE QUADRANGLE)



(Joins sheet 28)
R. 27 E.
R. 28 E.
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 38)
T. 15 S.
T. 16 S.
18 17
19 20
25 30
36 31
30 29
31 32
11 12
14 13
14 13
23 24
13 18
19
25
36 30
31
APACHE PASS ROAD
FORT BOWIE ROAD
Pinery Creek
Pinery
Creek
5
12
27
34
38
42
45

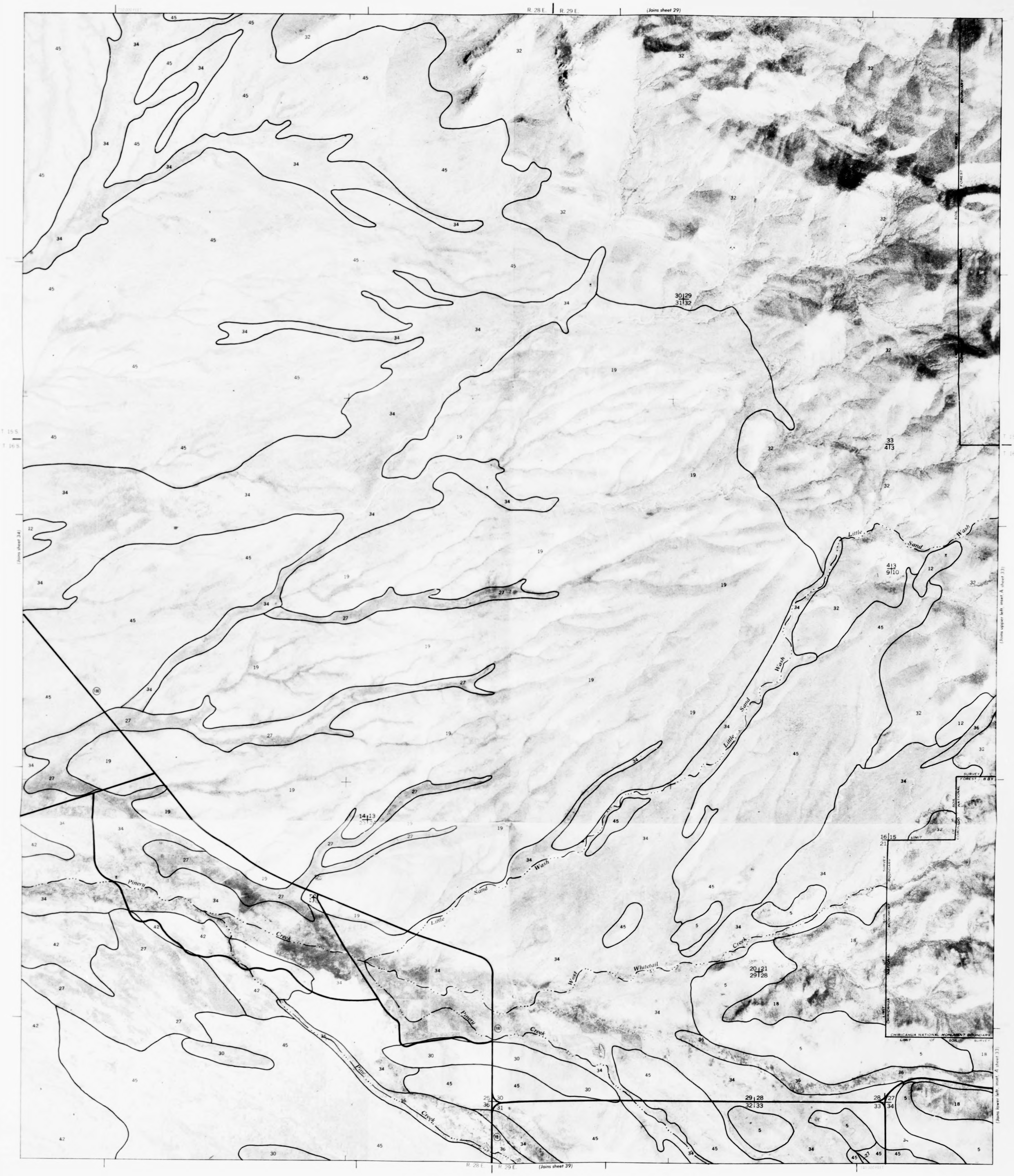
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 35
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(COCHISE HEAD SW QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 29)
(Joins sheet 34)
(Joins sheet 39)
(Joins upper left inset A sheet 33)
(Joins lower left inset A sheet 33)
T. 15 S.
T. 16 S.
Little Sand Wash
Pinery Creek
West Whitetail Creek
Pine Creek
181
FOREST BOUNDARY
NATIONAL FOREST BOUNDARY
LIMIT OF SOIL SURVEY
CHIRICAHUA NATIONAL MONUMENT BOUNDARY
30 29
31 32
33
4 3
4 3
9 10
14 13
23 24
16 15
21
20 21
29 28
25 30
36 31
29 28
32 33
28 27
33 34
5
12
18
19
27
30
32
34
36
42
45
740 000 FEET

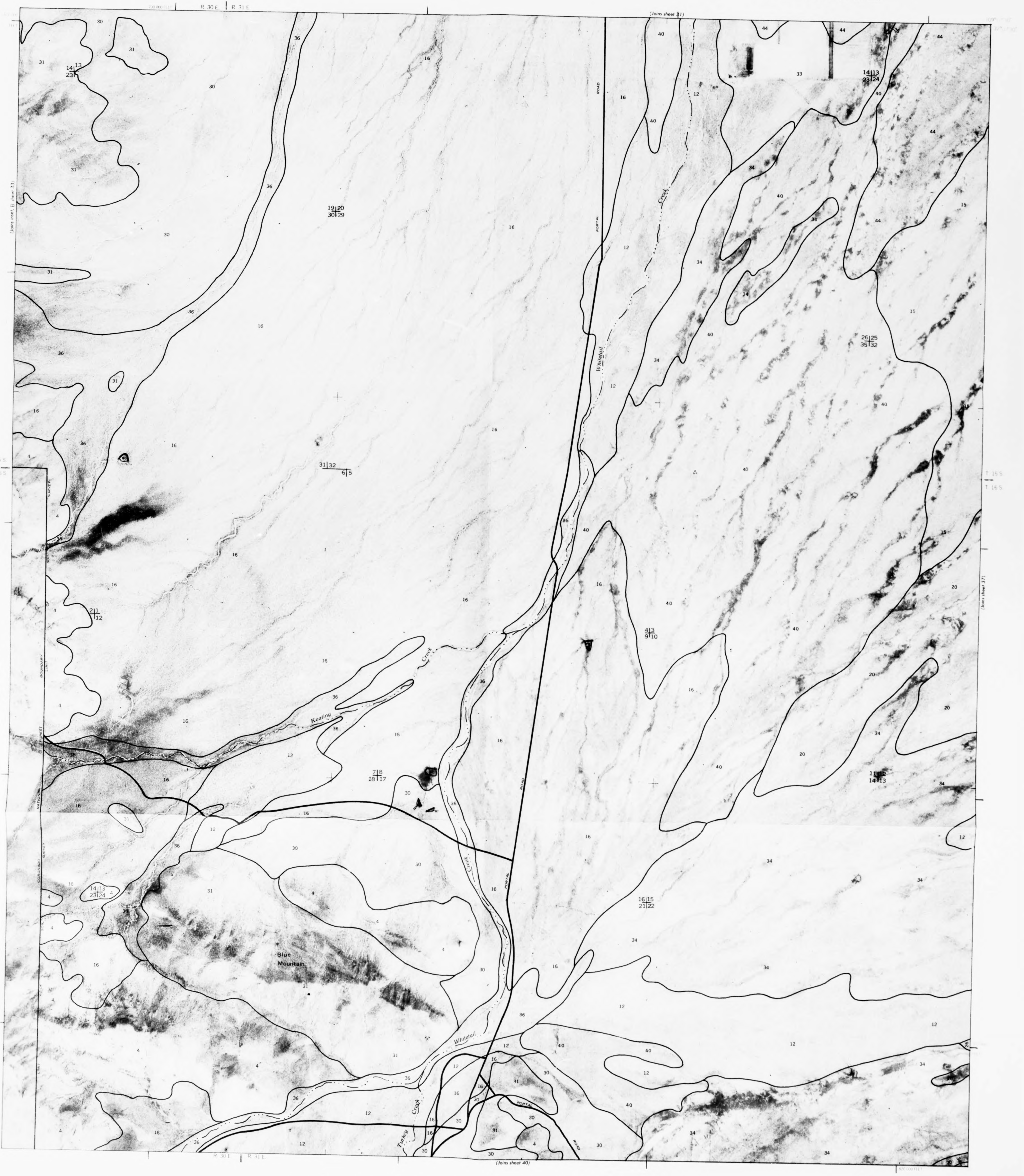
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

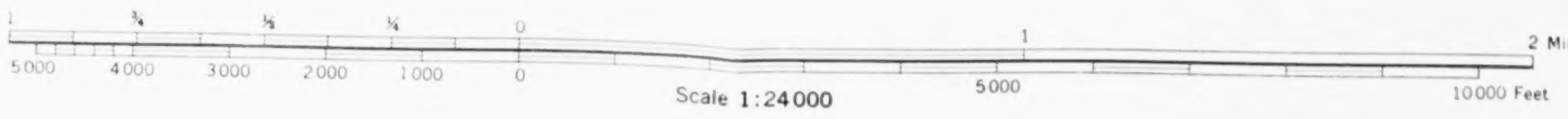
This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 36
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE, GRAHAM AND GREENLEE COUNTIES
(VANAR SW QUADRANGLE)


R. 30 E.
R. 31 E.
(Joins sheet 31)
(Joins inset B sheet 33)
(Joins sheet 37)
(Joins sheet 40)
T. 15 S.
T. 16 S.
PORTAL ROAD
Whitetail Creek
Keating Creek
Turkey Creek
Blue Mountain
CORONADO NATIONAL FOREST BOUNDARY
SURVEY LIMIT
30
31
36
16
12
40
44
33
34
15
20
4
14|13 23|24
19|20 30|29
31|32 6|5
26|25 35|32
2|1 11|12
4|3 9|10
7|8 18|17
11|12 14|13
16|15 21|22


1
¾
½
¼
0
1
2 Miles
5000
4000
3000
2000
1000
0
5000
10 000 Feet

Scale 1:24 000

This soil survey was compiled in 1975 by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

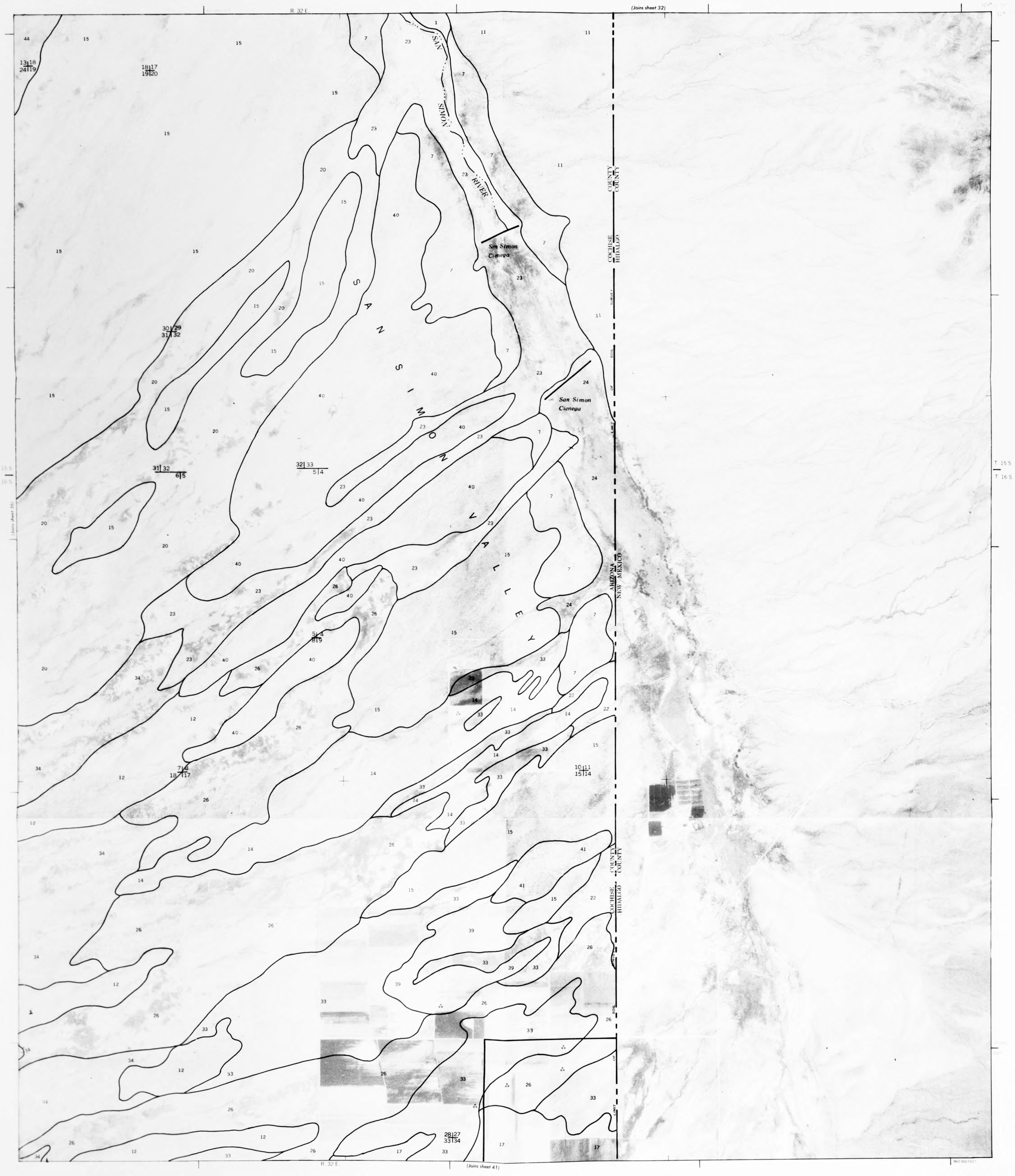
Orthophotobase compiled from 1972 and 1973 aerial photography by the U. S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

SAN SIMON AREA, ARIZONA NO. 36

SHEET NO. 36 OF 41

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 37
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(VANAR SE QUADRANGLE)


R. 32 E.
(Joins sheet 32)
44
15
13|18
24|19
18|17
19|20
1
7
23
SAN SIMON RIVER
11
15
20
40
7
23
San Simon Cienega
SAN SIMON VALLEY
30|29
31|32
31|32
6|5
32|33
5|4
COCHISE COUNTY
HIDALGO COUNTY
24
San Simon Cienega
T. 15 S.
T. 16 S.
(Joins sheet 36)
ARIZONA
NEW MEXICO
26
5|4
8|9
34
12
33
14
22
7|8
18|17
10|11
15|14
41
39
17
28|27
33|34
R. 32 E.
(Joins sheet 41)
860 000 FEET

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

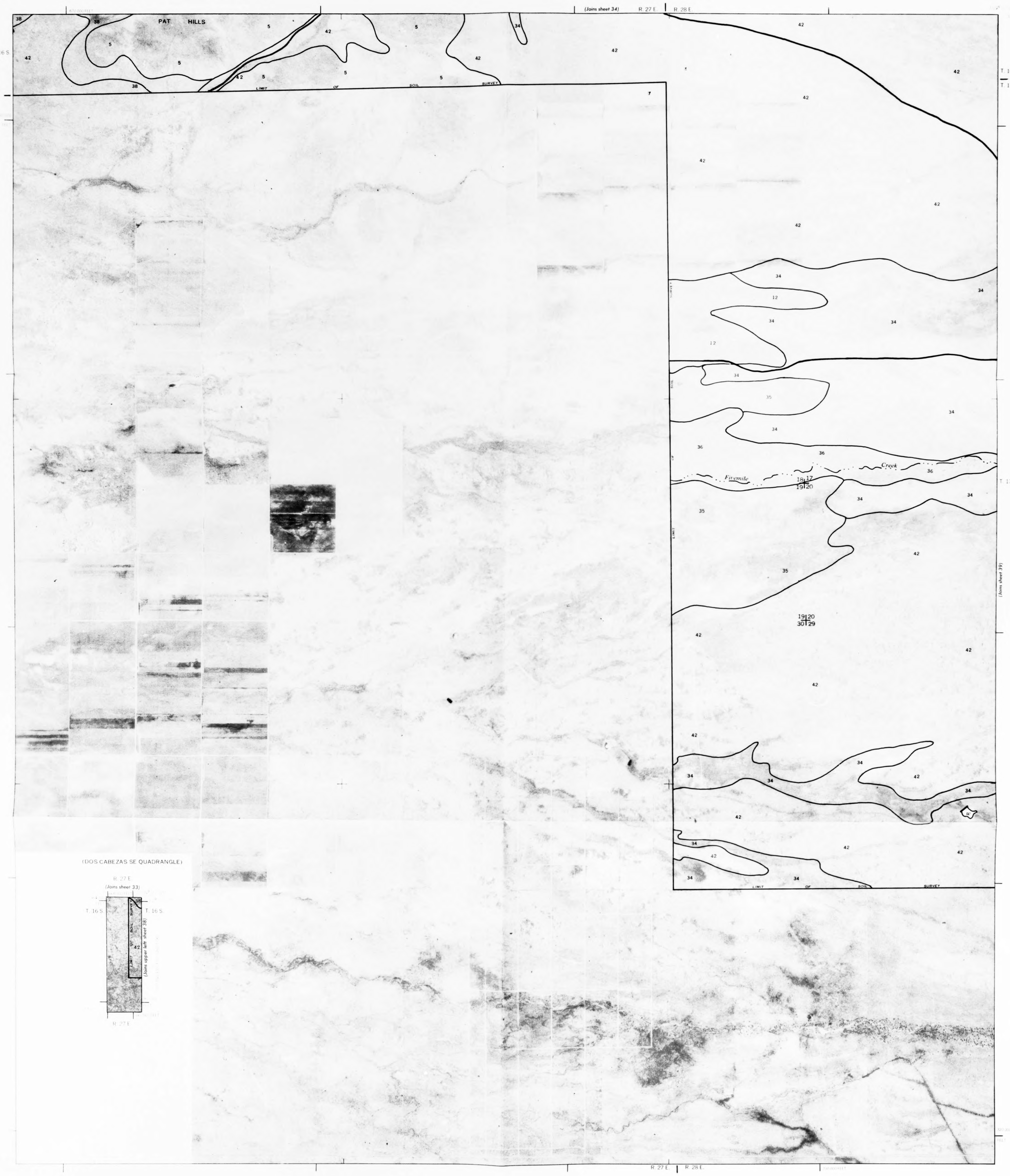
SHEET NO. 37 OF 41

Q1-2142

Box 11

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 38
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(SQUARETOP HILLS NE QUADRANGLE)


(Joins sheet 34)
R. 27 E.
R. 28 E.
PAT HILLS
T. 16 S.
T. 17 S.
LIMIT OF SOIL SURVEY
38
5
42
34
12
35
36
Firemile Creek
18 17
19 20
30 29
w
(Joins sheet 39)
(DOS CABEZAS SE QUADRANGLE)
(Joins sheet 33)
(Joins upper left sheet 38)
320 000 FEET
700 000 FEET

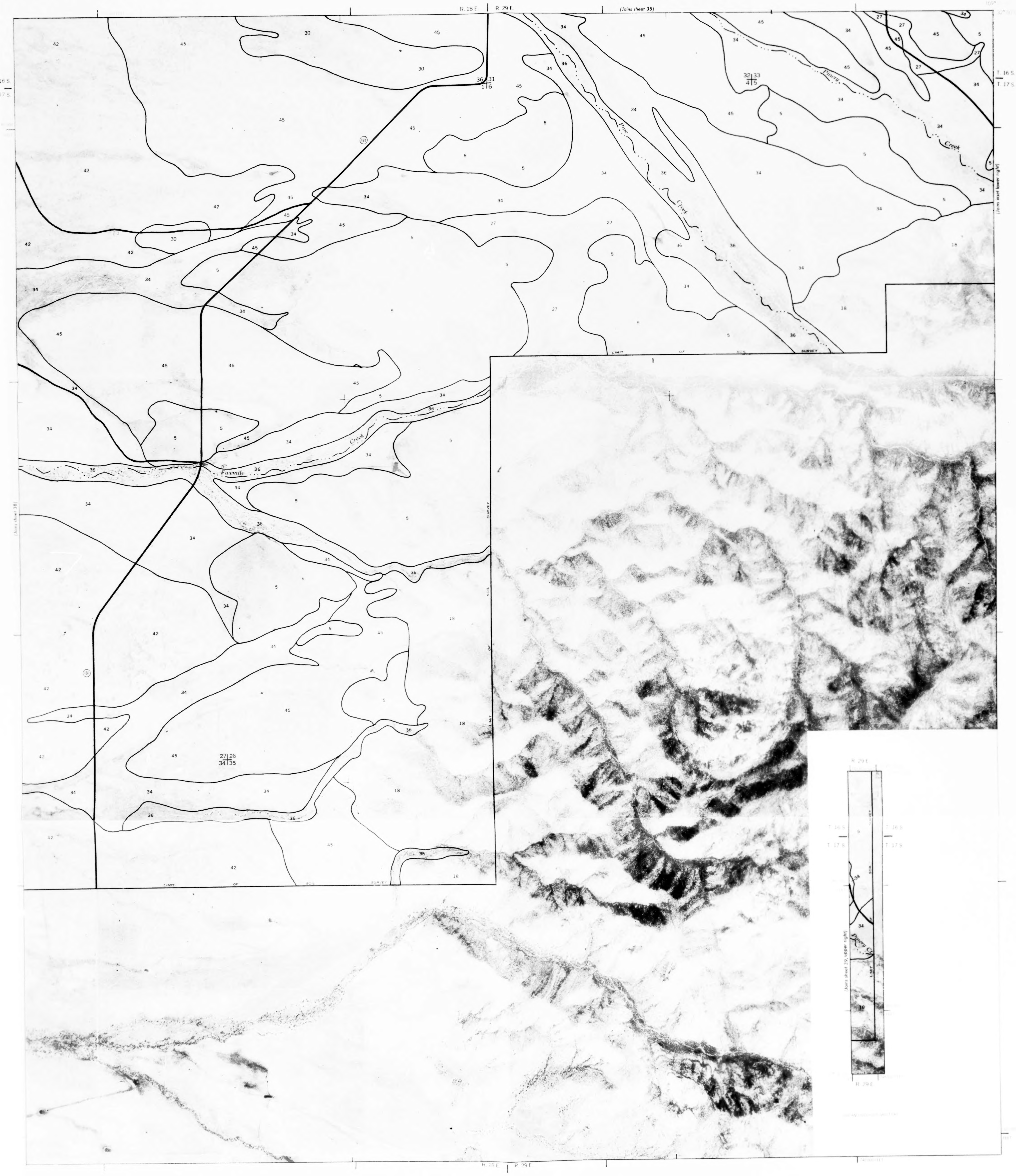
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 39
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(CHIRICAHUA PEAK NW QUADRANGLE)


R. 28 E.
R. 29 E.
(Joins sheet 35)
(Joins sheet 38)
(Joins inset lower right)
(Joins sheet 39, upper right)
T. 16 S.
T. 17 S.
Pinery Creek
Pine Creek
Fivemile Creek
181
LIMIT OF SOIL SURVEY
36 31
1 6
32 33
4 5
27 26
34 35
5
18
27
30
34
35
36
42
45

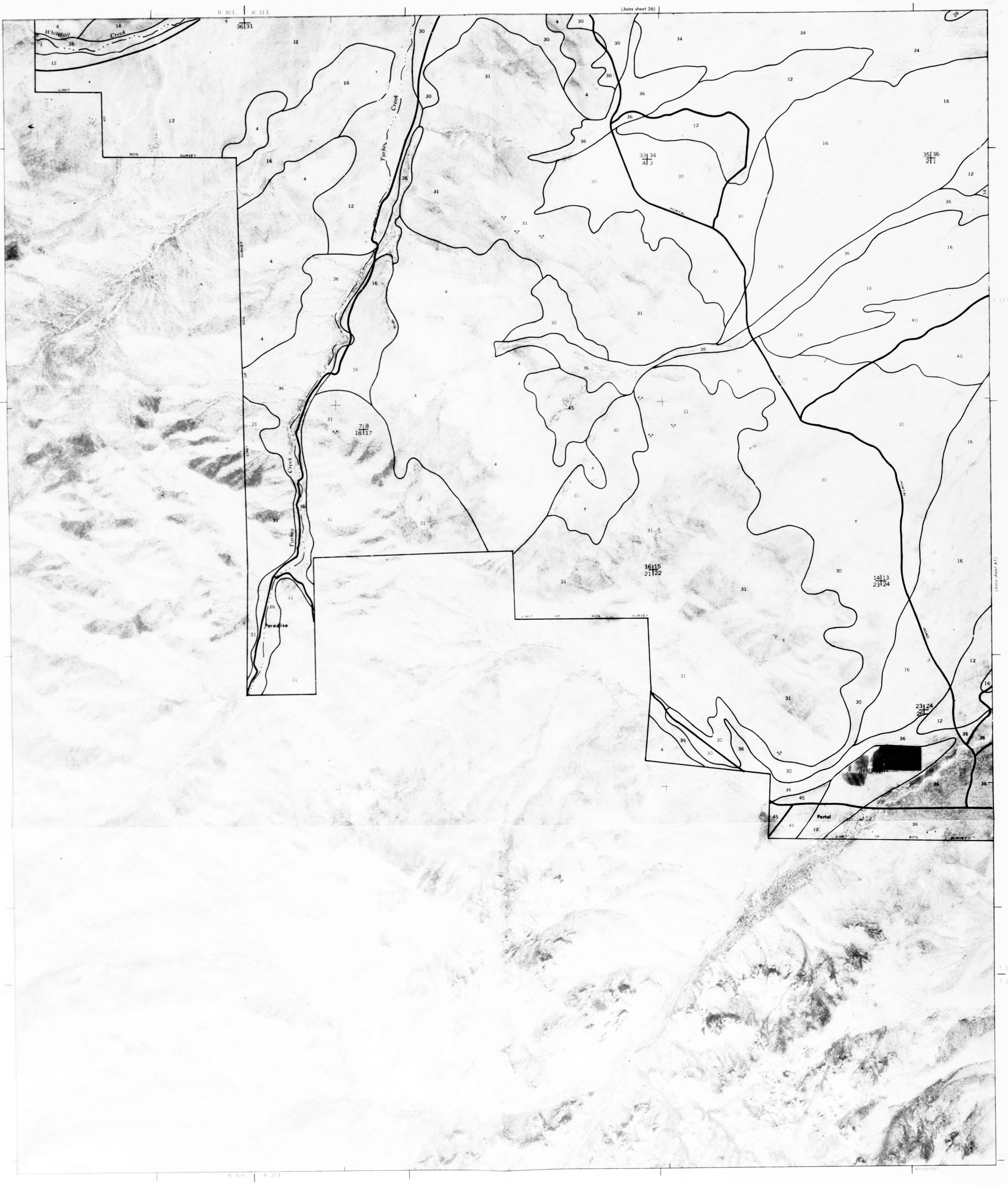
R. 28 E. R. 29 E.

Scale 1:24000

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000 foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 40
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(PORTAL NW QUADRANGLE)


R 30 E.
R 31 E.
(Joins sheet 36)
(Joins sheet 41)
36|31
Whitetail Creek
Turkey Creek
LIMIT OF SOIL SURVEY
Paradise
Portal
PORTAL ROAD
7|8
18|17
33|34
4|3
35|36
2|1
16|15
21|22
14|13
23|24
23|24
26
T 17 S.
T 18 S.
820 000 FEET
4
12
16
30
31
34
36
40
45

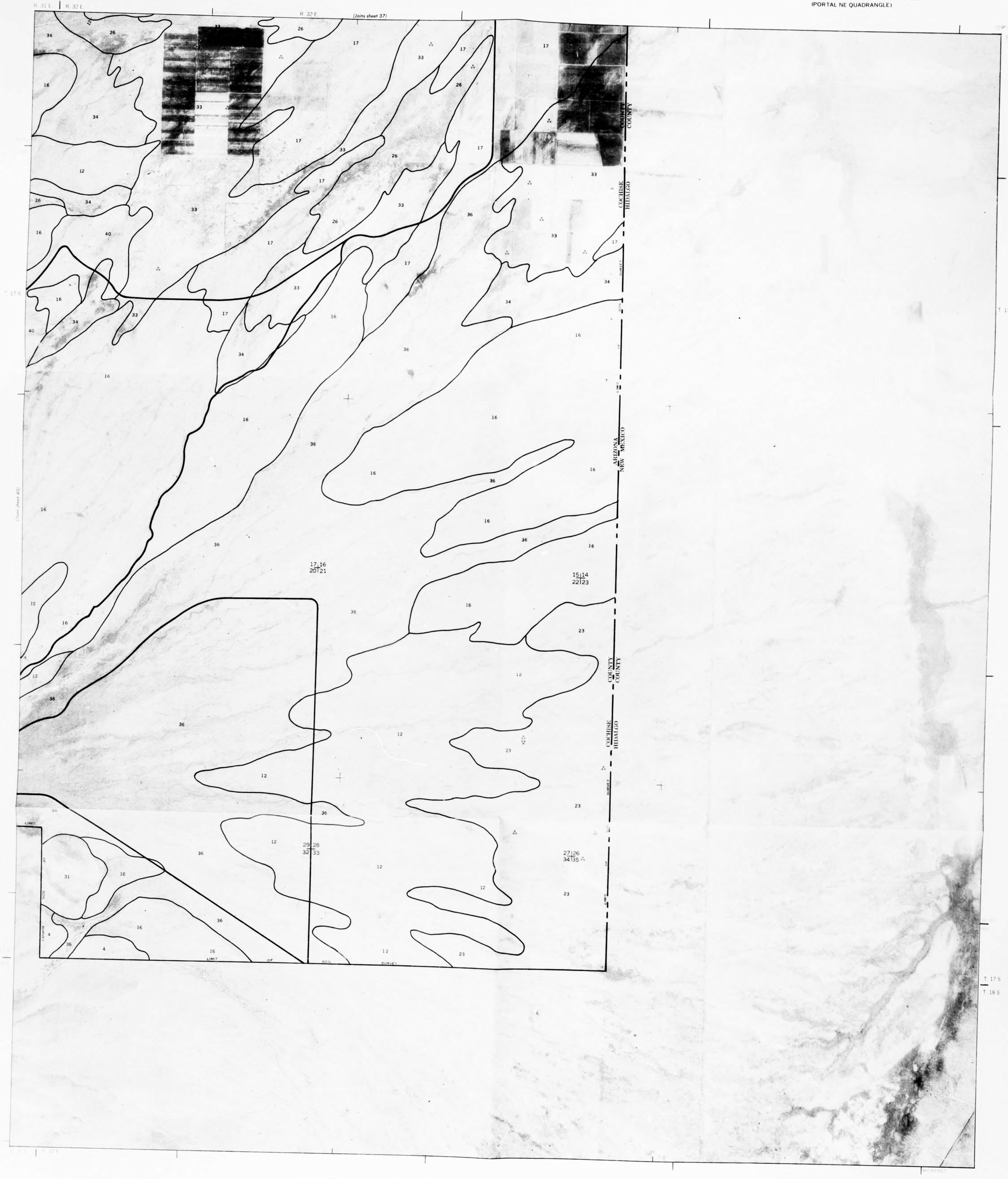
Scale 1:24 000
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet

[illegible]

Orthophotobase compiled from 1972 and 1973 aerial photography
by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 41
SAN SIMON AREA, ARIZONA, PARTS OF COCHISE,
GRAHAM AND GREENLEE COUNTIES
(PORTAL NE QUADRANGLE)


R. 31 E.
R. 32 E.
R. 32 E.
(Joins sheet 37)
(Joins sheet 40)
T. 17 S.
T. 17 S.
T. 18 S.
COCHISE COUNTY
HIDALGO COUNTY
ARIZONA
NEW MEXICO
LIMIT OF SOIL SURVEY
17 16
20 21
15 14
22 23
29 28
32 33
27 26
34 35
4
12
16
17
23
26
31
33
34
36
40
860 000 FEET
Scale 1:24000
1
½
0
1
2 Miles
5000
4000
3000
2000
1000
0
5000
10 000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1972 and 1973 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

SAN SIMON AREA, ARIZONA NO. 41

SHEET NO 41 OF 41

81-2172